DOCUMENT RESUME

ED 312 425 CE 053 500

AUTHOR Assani, Sydney P.
TITLE How Can the Teaching of Woodwork and Science at Secondary School Level Be Integrated?
INSTITUTION Linkoping Univ. (Sweden). Dept. of Education and Psychology.
SPONS AGENCY Swedish International Development Authority (SIDA).
REPORT NO ISBN-91-7870-490-1; LiU-PEK-R-133
PUB DATE May 89
NOTE 92p.; Master's thesis, Linkoping University.
PUB TYPE Dissertations/Theses - Master Theses (042) -- Tests/Evaluation Instruments (160) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Course Content; *Curriculum Design; Curriculum Research; Developing Nations; Foreign Countries; Industrial Arts; Instructional Design; Instructional Development; *Integrated Activities; *Interdisciplinary Approach; *Science Instruction; Science Teachers; Secondary Education; Shop Curriculum; Unified Studies Curriculum; Vocational Education; *Woodworking
IDENTIFIERS *Zimbabwe

ABSTRACT

A study was made of how to integrate science instruction (specifically, science for Zimbabwe syllabus number 50006) and woodworking. In order to formulate its recommendations, the study sought to analyze course syllabi; collect data on teachers' years of teaching within and without their areas of specialization (woodworking and science); analyze the implementation of the courses; determine the possible flexibility in the use of human and physical resources across academic departments; and establish the willingness of teachers and heads of departments to integrate woodworking and science. Three secondary schools in Zimbabwe participated. Data were collected through a questionnaire administered to 132 students and through interviews of 2 subject education officers, 3 head- and deputy headmasters, 5 heads of departments, and 11 science and 3 woodworking teachers. The following recommendations were made: (1) the type of integration method most suitable was a modification of the correlation method (used to develop common relations between subjects) called interdependence integration, in which teachers teach as they usually do but try to link the elements of their course with the other subject; and (2) a staff development program should be employed to prepare teachers. (A 21-item bibliography and an appendix containing interview schedules and the questionnaire conclude the document.) (CML)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED312425

How can the teaching of woodwork and science at secondary school level be integrated?

Sydney P. Assani

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

C053500

LINKÖPING UNIVERSITY
Department of Education and Psychology
RAPPORT LiU-PEK-R-133

BEST COPY AVAILAB

HOW CAN THE TEACHING OF WOODWORK AND SCIENCE AT SECONDARY SCHOOL LEVEL BE INTEGRATED?

Sydney P. Assani

DISSERTATION
submitted as partial fulfilment for an
MA DEGREE IN WOODWORK EDUCATION

Linköping University
Department of Education and Psychology
RAPPORT LiU-PEK-R-133

Linköping University
Department of Education and Psychology
RAPPORT LiU-PEK-R-133

HOW CAN THE TEACHING OF WOODWORK AND SCIENCE AT SECONDARY SCHOOL LEVEL BE INTEGRATED?

ISBN 91-7870-490-1
ISSN 0282-4957

Linköping University
Department of Education and Psychology
581 83 Linköping
Phone 013-28 10 00

Avdelning, institution, fakultet
Division, department, faculty

LINKÖPING UNIVERSITY
Department of education
and psychology

ISBN:	91-7870-490-1
ISSN:	0282-4957
Rapporter: Report no:	133
Upplagans storlek: Number of copies:	250
Datum: Date:	May 1989

Projekt:
Project:

Titel:
Title:

HOW CAN THE TEACHING OF WOODWORK AND SCIENCE AT SECONDARY SCHOOL LEVEL BE INTEGRATED?

Författare:
Author:

Sydney P. Assani

Supervisor: Runa Patel

Uppdragsgivare:
Commissioned by:

Linköping University
in cooperation with
SIDA

Dnr.:
Call no:

Rapporttyp:
Kind of report:

- ☐ Examensarbete/Final project
- ☐ Delrapport/Progress report
- ☐ Reserapport/Travel report
- ☐ Slutrapport/Final report
- ☒ Övrig rapport/Other kind of report

Rapportspråk:
Language:

- ☐ Svenska/Swedish
- ☒ Engelska/English
- ☐ _____

Sammanfattning (högst 150 ord):
Abstract (150 words):

This is an exploratory study where the case was made of three secondary schools in one region in Zimbabwe. The aim of the study was to suggest one way in which the teaching of woodwork and science at "ordinary" level could be integrated. Factors which can facilitate the integration were studied by interviewing Headmasters, teachers and Heads of Department for science and woodwork and administering questionnaires to form three students taking woodwork as their opinion. Education Officers for science and technical subjects were also interviewed

The analysis of the results showed that some of the factors like the availability of common elements in science and in woodwork, the willingness of teachers to integrate the subjects, the flexibility of the teachers in the use of physical resources, and teachers' attitudes can facilitate integration. The other factors like the inflexibility of the science syllabus, lack of practising team teaching, inflexibility in the use of teachers in teaching other subject, and the lack of familiarity with contents of the other subject among teachers work against integration.

A modified type of integration called interdependence was suggested to be suitable for the Zimbabwean situation. Suggestions are made on how this could be implemented considering the outcome of the different facts.

Nyckelord (högst 8):
Keywords (8):

Teaching, Woodwork, Science, Secondary, School, Integration

Bibliotekets anteckningar

FOREWORD

This Master of Arts dissertation was prepared within the framework of a bilateral cooperation project between Sweden and Zimbabwe. The Swedish International Development Authority - SIDA - provided financial support for the project.

Linköping University has been responsible for the education in cooperation with the University of Gothenburg. Fifteen students participated in the programme. Three students completed the main part of their education at University of Gothenburg. Twelve students completed their education at Linköping University.

For the twelve Linköping University students, the Department of Crafts and Design held the major responsibility for the courses. The exceptions being the course in research methodology and the actual preparation of the dissertations where the Department of Education and Psychology was responsible. Facilities for the fieldwork were provided by the University of Zimbabwe.

The Department of Crafts and Design has been the host department and responsible for the administration and coordination of the programme.

Linköping May 16, 1989

Bengt Wetterstrand
Head of Department
Dept of Crafts and Design

Lars Owe Dahlgren
Professor and Examiner
Dept of Education and Psychology

ACKNOWLEDGEMENTS

The author would like to thank the following people for making this study a success.

Firstly, he would like to thank the following people at Linköping University, Department of Education and Psychology, Runa Patel (Ms) for providing the necessary background Research Methodology as a lecturer as well as for the advice and guidance she provided as the supervisor of this study. The Librarian for helping in searching for the necessary reading material.

Secondly, he would like to thank Dr. Nyagura and other members of staff of the Curriculum Department of the University of Zimbabwe for making all the necessary preparations for the collection of information in Zimbabwe.

Thirdly, he is grateful to all the Headmasters, teachers and Heads of Woodwork and Science Departments and all the then form three students taking Woodwork as their option in the three schools where the study was carried out for providing the necessary information. He would also like to thank the Education Officers for Technical Subjects and Science in the Region in which the study was done for providing the necessary information.

Fourthly, he is grateful to the Department of Craft and Design for providing the necessary facilities for preparing the report. He is particularly thankful to Lennart Martinsson and Anita Kilander who were directly involved in the provision of facilities. He is also grateful to Gordon Evans for editing this dissertation.

Lastly, he is grateful to his wife Flossie and his son Mustafa for their encouragement and patience during the time demanding period of data collection whilst in Zimbabwe.

CONTENTS

Page

FOREWORD

ACKNOWLEDGEMENT

LIST OF TABLES 11

INTRODUCTION 13

1. KNOWLEDGE AND THE CURRICULUM 16
   - 1.1 Forms of knowledge 16
   - 1.2 Disciplines 18
   - 1.3 The School subject 19
   - 1.4 An integrated Curriculum 20
   - 1.5 Psychological aspects of integration 20
   - 1.6 A suitable type of integration 22
   - 1.7 Possible teaching arrangements 23
   - 1.8 Research objectives 24

2. METHODOLOGY 26
   - 2.1 Subjects 26
   - 2.2 Instruments 27
   - 2.3 Validity, reliability and trial runs 28
   - 2.4 Procedure 29

3. PRESENTATION OF RESEARCH FINDINGS 31
   - 3.1 Qualifications and experiences of school teaching staff 31
   - 3.2 Analysis of the ordinary level woodwork syllabus and the science for Zimbabwe syllabus number 5006 33
   - 3.3 The organization of content for teaching 36
   - 3.4 Flexibility in the use of human resources 37
   - 3.5 Flexibility in the use of physical resources 40
     - 3.5.1 Flexibility in the use of physical resources by teachers 40
     - 3.5.2 Flexibility in the use of physical resources by students 42
   - 3.6 Willingness of school staff to integrate the subjects 45

4. DISCUSSION 49
   - 4.1 Summary of results 49
   - 4.2 Discussion of findings 51

4.3 A suggested program for integration through inter-dependence 56
4.4 Recommendations of areas for further study 57

REFERENCES 58

APPENDICES

Appendix 1. Interview schedule for Education Officers
Appendix 2. Interview schedule for Headmasters or Deputy Headmasters
Appendix 3. Interview schedule for Heads of Departments of woodwork and those of science
Appendix 4. Interview schedule for woodwork and science teachers
Appendix 5. Questionnaire for form three students
Appendix 6. A letter of introduction for the researcher provided by the University of Zimbabwe

LIST OF TABLES

		Page
Table 1.	A table showing the educational qualifications of the teaching staff	32
Table 2.	A table showing the number of years of experience of the teaching staff	32
Table 3.	A table showing number of students' indication of availability of woodwork and science text-books	42
Table 4.	A table showing students' indication of the most important source of science information	43
Table 5.	A table showing students' indication of the most important source of woodwork information	43
Table 6.	A table showing the number of students who indicated that they had used either science textbooks for woodwork or woodwork textbooks for science	44

INTRODUCTION

The author, a woodwork teacher was once in a situation of having to teach science up to "ordinary" level. During this time he has always felt that what is taught in science is almost the same as what is taught in woodwork. The only difference being that science emphasised the discovery of the properties and characteristics of materials like wood, whilst woodwork emphasised on the use of these properties. Whilst it is like that, it was felt that there was something missing in the way in which the two subjects dealing with the same elements are taught. It is the linking of the ideas taught in woodwork with the same ideas taught in science which is missing. When the elements taught in woodwork and those taught in science are linked, the subjects can be said to be integrated. The integrated teaching of subjects is a teaching approach in which an attempt is made to combine logically related elements of different subjects. This is done in order to improve the students' understanding of the subjects in question. Accordingly, this study is concerned with: "*How the teaching of woodwork can be integrated with the teaching of science for Zimbabwe syllabus 5006*" .

Why integrate woodwork and science?
If the teaching of science and woodwork is integrated it is likely that the learning of these subjects will be improved in a number of ways. Firstly, the learning of the subjects will be more meaningful. Integration will provide a wide range of situations, some of which will be real, in which the concepts learnt in woodwork and in science will be reinforced. These concepts will also be used to interpret new observations and experiences with links being made by the teachers. The students will also be able to relate new information to previous experiences from different subjects. Some of these subjects like woodwork are linked to real practical activities in which the students will be taking part. An example of such a situation is like when students are involved in making artefacts in the workshop. This makes the students' learning more relevant, with the understanding of concepts and a direct transfer of knowledge more readily. As Cunningham (1971, p. 82) puts it, *conceptual development emerges from a wealth of concrete experiences.* He goes on to say that the quality of a student's learning can be judged by the extent to which he uses conceptual patterns and their related processes and skills in a new context.

Secondly, integration will improve the creative ability of the students. Sjögren (1987 , p 28) defines creative ability as *the ability to discover problems, gather ideas and known facts in a way which is new to the individual in solving problems.* To improve the creative ability of the students in woodwork a number of factors should be made available. For example, students should have enough knowledge about materials. By linking the knowledge of materials acquired in woodwork with the knowledge of the same materials acquired through science, a wider base of knowledge is created. It is from this wide base of knowledge that creative ability will spring. If the skills learnt in woodwork

are given an explanation through principles of physical sciences, it will enable an individual to experiment with other related techniques to produce similar results. Through the recurrence of the problem-solving techniques in both subjects the students will acquire the ability to analyse a problem. They will also be able to pose a number of solutions out of which one should be chosen in an attempt to solve the problem. The linking of the elements from the two subjects will give the students the attitude of combining skills, knowledge and experience in solving daily problems in life.

Thirdly, when these subjects are integrated, the knowledge acquired in science will instantly find application in woodwork. This will reduce the abstraction and inertness of ideas in science. According to Stenhouse (1985, p 197) *Conversion of inert to "ert" ideas must be essentially a matter of converting "knowledge that" to "knowledge how" a matter of decoding the inert ideas that have been amassed into terms of understanding and, where appropriate, into terms of various forms of activities; thus knowing how and doing*. Sciences and woodwork have interrelated elements. What remains is for the teachers to link these elements. By using ideas from science to explain activities in woodwork and vice versa, the teachers will be changing the ideas into useful ones.

The study is important in a number of ways. Firstly, the study will identify the interrelated elements found in Science for Zimbabwe syllabus number 5006 and woodwork. Tanner and Tanner (1971) suggest that the extent of attainment of integration partly depends on the teachers' ability to develop common threads between the subjects. In other words it will not be possible for teachers to talk about integration let alone do it until they see these common elements as being interrelated. In the study an attempt will be made to recommend how the interrelated elements can be identified. It is hoped that this will help those who are directly or indirectly involved in the teaching of woodwork and science to identify interrelated elements. Hopefully, the recommendations will stimulate teachers to identify common elements in other related subjects and so enhance an integrated teaching of these too.

Secondly an attempt will be made to recommend how the teaching of science for Zimbabwe syllabus number 5006 and woodwork at "ordinary" level can be integrated. This should hopefully be useful to those who are directly or indirectly involved in the teaching of the two subjects. Stenhouse (1985) has shown dissatisfaction with the knowledge we acquire because it is "the knowledge that" and not "the knowledge how". It is not productive knowledge. Most of the work which has been done on integration is concerned with familiarising educators with the existence and possibility of the integrated curriculum. Not much has been done on ' the knowledge how' the subjects in the curriculum can be integrated. In this study an attempt will be made to recommend how, considering the present Zimbabwean situation, the teaching of woodwork and science for Zimbabwe syllabus number 5006 can be integrated. This should possibly make the learning of these subjects, more

meaningful, improve the creative ability of the students and give them an opportunity to apply knowledge learnt in science to woodwork.

Thirdly, it is hoped that this study will stimulate further research in the area of *knowledge and the curriculum* especially the part concerned with integration of subjects. This is a step forward in the unending process of building up knowledge on improvement of teaching methods.

1. KNOWLEDGE AND THE CURRICULUM

This study deals with issues related to the improvement of teaching and learning of woodwork and science at "ordinary" level. In so doing the study is addressing itself to issues concerning the curriculum and knowledge. The definitions of the curriculum are many, varied, and still undergoing changes. This is because of the changes in the factors which affect these definitions, (Tanner and Tanner 1975). Some of the factors are such things as
(1) the learning process,
(2) the idea of learners which those who are concerned about them have,
(3) social conditions,
(4) the widening expectation of the role played by the school in the society.

According to Tanner and Tanner (1975) the definitions of the curriculum portray a partial perspective of the term in relation to its function in the school. They then propose a more comprehensive working definition in which they suggest that *A curriculum is the planned and guided learning experiences under the auspices of the school for the learners' continuous and willful growth in personal and social competence (p 45)* . This definition implies that acceptable methods should be use in transmitting an accumulated content of knowledge which has been systematically restructured in relation to the life experiences of the learner, today and in the future. This is done in order to achieve special specified objectives. This study is concerned with how the transmission of this knowledge can be improved through the integration of subjects to make knowledge more meaningful and related to real life conditions.

In all activities and walks of life, people use knowledge. Knowledge is about different things and enables different actions. It also differs in how widely it is distributed, how it is gained and held and how it is seen as warranted (Znaniecki, 1965, in Buchmann 1987 p. 151).

1.1 Forms of knowledge

According to Hirst (1974) the field of human knowledge can be seen to be differentiated into seven distinct forms none of which is ultimately reducible to any of the others singly or in combination. He goes on to say that the whole field of knowledge is made up of different types of true propositions or statements. These propositions have elements which are common to them all. These common elements are;
(1) the concepts which make the propositions which are also referred to as categorial concepts,
(2) the logical structures which these propositions use,
(3) the criteria for truth with which these propositions are judged, and
(4) the methodology which is used in accumulating these true propositions.

These elements have been referred to by Hirst as categorial distinctions. It can be said then that the difference in the propositions lies in the elements which are common to the propositions.

Hirst (1974) goes on to propose that concepts can be given qualities which distinguish them from each other. He mentions three main types of qualities. These are; the quality of directly or indirectly distinguishing the features of the world, the quality of distinguishing states of mind and the quality of distinguishing the moral character of actions. There are three different types of qualities of concepts and these concepts make different types of propositions. It means, therefore, that using these qualities, the propositions can be classified into three main different types of qualities of propositions. It was suggested that the difference in the forms of knowledge lies in the different types of propositions which make them. If then there are seven different forms of knowledge which have different types of propositions, while the propositions are made up of three main types of qualities of concepts, it might as well be said that the seven different forms of knowledge share three main qualities of categorial concepts.

Hirst (1974) made an attempt to clarify the fact about concepts by ascertaining that the concepts of one character cannot be reduced to concepts of another character. Every form then is said to involve concepts which are distinctive and unique to it.

Whilst it is like that each form of knowledge shares concepts of the same character with another form. It can be seen that this prompts the fact that there must be a certain type of relationship amongst the different forms of knowledge. This is ascertained by Hirst (1974, p 91) when he states that *Certainly the relations of concepts and propositions across divisions of knowledge are legion.* If relations of concepts and propositions across divisions of knowledge are many, then the forms which are made up of these concepts and propositions are also related to each other.

The previously given definition of the curriculum implies that knowledge is restructured according to perceived present and future life experiences of the students. The restructured knowledge forms school subjects. This then means that the knowledge content is not according to forms of knowledge. Subjects therefore are not categorized according to unique propositions which make them. But then, if forms of knowledge, which are said to be distinct, have conceptual interrelationships, how much more interrelation should be expected in subjects? Considering the fact that subjects are made by restructuring the knowledge so that certain objectives are achieved by the students when that knowledge is acquired. The subjects therefore, are not distinct in nature. It is expected that subjects have more interrelations than the forms of knowledge. This is even more so when we consider the fact that objectives of the subjects correspond to a single main aim.

Griffiths (1986) when comparing Hirst's theory of forms of knowledge with Körner's categorial frameworks of knowledge, said that Körner's theory of categorial frameworks of knowledge provide support to Hirst's contention that the forms of knowledge are only partly defined by their subject matter. Even so, not all of Hirst's theory is compatible with Körner's analysis. Körner's analysis does not support Hirst's contention that there are just a fixed number of forms of knowledge. For example Körner discusses quantum mechanics and classical dynamics as separate theories with different concepts and distinct logical systems. It can be seen that physics, let alone Hirst's physical sciences is not necessarily a single form.

Continuing with the comparison, Griffiths says that Hirst and Körner agree that there are forms of knowledge logically distinguishable. But he sees Hirst as disagreeing with the view which is implied by Körner that there are as many forms as we may want to distinguish. Körner seems to indicate that the distinction is determined by how narrow in outlook or scope we may want to be. This means that the field of human knowledge is divided into more forms than those which are known today. What is important to the present study is the fact that the field of knowledge can be seen as being divided into categories.

1.2 Disciplines

Forms of human knowledge are given labels like Mathematics, Physical Sciences, Literature, Fine arts, Philosophy, and Human Sciences. The same labels are used in University and in school teaching situations under an umbrella term of "subjects" (Hirst 1974). But there are more than seven labels used in the University and the school curricula. In which case it can be said that some other labels have been used for the subjects in the University and school teaching situation.

On the issue concerning the additional labels of the subjects, Hirst (1974) goes on to state that the seven forms of knowledge are further divided into sub-forms of knowledge which are referred to as disciplines. For example, Physics, Biology and Chemistry are sub-forms of Physical Sciences. The further division of forms of knowledge results in numerous labels of disciplines.

According to Hirst (1974, p.136) *"If the same label as that of a form is used for a University teaching or research unit What it covers may be different from what is covered in a corresponding "form"*. He explains this by saying that such units are concerned with something more than the confines of the forms of knowledge. These forms may use concepts with the same characters as those of the forms themselves. This further interpreted means that the teaching units with the labels of the forms are more diffuse and therefore less autonomous than the forms of knowledge.

If this is so, then the explanation serves as a confirmation of the fact that in the teaching units of the University or the school subjects, there are likely to be more interrelated elements than in the forms of knowledge.

The previously given definition of the curriculum implies that a curriculum is socially based and therefore aimed at meeting certain objectives in the society. The structure of the concepts in the disciplines, if taken from the forms of knowledge, may not all be found to be able to meet the objectives of the society. This explains why concepts in the different disciplines have been restructured to form subjects which will help to meet the objectives of the society. Such disciplines can no longer be said to be made up of boundaries based on the forms of knowledge from which the disciplines are derived. The disciplines made through the restructuring of knowledge still retain the labels of the disciplines in particular forms of knowledge. Across these disciplines there are likely to be more interrelationships of conceptual structures than there would have been in disciplines from unique forms of knowledge. It can be said then that the disciplines which are formed according to social requirements are related to each other.

Although there are relations among the disciplines,when it comes to teaching, no attempt to link related concepts is made. The elements in each discipline are treated as belonging to single compartmentalised disciplines. This does not agree with the explanations of the origin of disciplines in relation to forms of knowledge previously given. There is a need to integrate the interrelated elements from these disciplines.

1.3 The School subject

A subject structured curriculum is based on school subjects which bear labels most of which are the same as those of the previously mentioned disciplines. The school subjects, according to Hirst (1974), are a product of many social as well as historical factors. Most of the school subjects are units which mirror university specialization and the growth of knowledge. Some of them are a result of a limited range of the specialist knowledge that the teachers have. Teachers treat subjects along the line of their specialization.

Some subjects are being added to the list to bring into the curriculum objectives for which a social demand has arisen but which the existing subjects do not accommodate. The introduction of technical subjects into the school systems of many countries including Zimbabwe is an example. The aim is to provide skills, attitudes and knowledge to enable students to work constructively as they help in developing the country. Whilst school subjects maintain the labels and boundaries amongst them, in fact what goes under one subject label might as well go under several other subject labels.

A subject structured curriculum restricts pupils in their thinking, artificializes and limits both the process of learning and the way students will approach life. It hinders the integrated way of viewing life. Yet according to the previously given definition of the curriculum, in order to develop the many qualities of the mind which are recognized as being important for the present and future life of the individual, the individual must be educated in a context which views life as a unit since the life of an individual ought to be developed as a unit.

1.4 An integrated curriculum

Tanner and Tanner (1975, p. 676) proposed that *If the curriculum is to be improved, teachers of all persuasions and orientations must take a holistic view of what the school can and should do for the pupils at a given time of their lives.* When the task of educating individuals is looked at holistically rather than atomistically, special fields of knowledge tend to take a surbordinate position to individual and social needs. The different areas of teaching will be concerned with objectives beyond those of one form of knowledge. The application of different forms of knowledge to other areas will be considered to be more important.

The objectives pursued in any given subject are usually very varied in character. The most fundamental objectives are made up of elements within a logical structure of knowledge. The objectives of the enterprise of a school need to be looked at in their own right and the best structure for attaining them should be developed. For example bringing together all types of resources in the school to enhance maximum learning. The traditional school subject lacks explicit attention to the immediate practical or moral problems which the pupils face. While subjects are differentiated, the real life situation which these subjects are concerned with is not differentiated but is one whole. What we need to make the learning of woodwork and sciences more meaningful has been indicated clearly here. Hirst (1974) said that we need units of subjects which seek to integrate the forms of knowledge or cut across them for reasons which are true to the dependence of some elements of knowledge on those of the other kind. For example elements of woodwork should seek dependence on some elements of sciences for Zimbabwe and vice versa.

1.5 Psychological aspects of integration

So far all discussion on forms of knowledge, disciplines and subjects have been concerned with the need and the possibility to integrate the two subjects. It has also been concerned with the possible outcomes of integration. However the picture is incomplete without considering the connotations which the integration of subjects have towards the learner psychologically. Hirst (1974), in considering the psychological aspect of integration, states that the mind or consciousness of a person either is or ought to be a unit. The thoughts, emotions

and judgements should somehow be interrelated so that no tension or contradictions occur between these elements.

An individual's consciousness is the concepts, the knowledge and the judgements which the individual has acquired (Hirst1974). These have a unity. If the knowledge, concepts and judgements are transmitted in compartments which are not linked, they will be acquired as transmitted. This results in distorting the unity of the elements of the consciousness by making compartments out of the curriculum. According to Hirst(1974, p. 154) *by these means, artificial barriers are introduced into thought and feelings, thus inhibiting an understanding of what life is all about.* These are failures to achieve important elements in the structure of the consciousness. Such failures are brought in by failures to teach adequately the logical relations between elements that are of their logical structure. These failures can only be reduced to the minimum by integrating the teaching of those subjects with logical relations.

If scientific concepts are used to explain the behaviour of woodwork materials and different actions when making articles, then it can be argued that the two are complementary. This linking of the concepts in the two subjects is a way of organizing subjects so that they may be learnt in a context. This line of thought can be likened to Dahlgren's argument that,*everything is always a part of something larger or more inclusive (i.e. it has a meaning beyond itself) and it is this which we might call the context of understanding* (1984,p.34). He goes on to say that the learning which takes place in such cases is of a high quality. Integrating woodwork and science is imposing meaningfulness to both. This would result in bringing the two subjects to par. On one hand science, which is more theoretical and deals with abstract concepts will be made more practical and related to concrete things.On the other hand woodwork which deals with practical skills and concrete things will be made to involve skills which can be explained in a certain context according to scientific concepts.

The learning which might be achieved by integration will make possible the establishment of a new element in a progressively developing whole structure of elements. This results in the forging of the formal links between subjects. The integration of woodwork and sciences should aim at two things. Firstly, it should aim at forging links between concepts of science and those of woodwork. Secondly, it should deepen the understanding of both woodwork and science. As Hirst (1974) puts it, the attention to forging interform links must be at the price of systematic attention to the development of understanding within the separate forms. In teaching therefore, one should cater for the formal structure within the forms of knowledge as well as the formal structure that links them. Integration is necessary for understanding, but it must not take priority over the logical relations within the subjects.

1.6 A suitable type of integration

There are a number of different types of integration, Wheeler (1971) has classified these into two main classes. There is one class which is made up of three different types of integration which all relate various areas of knowledge to each other by attempting to set up integrative links within large subject areas. These three types of integration yield curricula which are; correlated, fused, or broadfields. The second class is made up of those types of integration which attempt to integrate by concentrating on functions, situations or problems. These call on knowledge which is found in a variety of subject fields and in those behaviours which are more generally determined. These types of integration yield synthesis, core and concentrated curricula.

The present study is concerned with the correlated type of integration. The choice has been prompted by a number of factors some of which have already been discussed.

With correlated integration it is possible to integrate subjects without having to restructure the curriculum, and so maintaining the subject boundaries as they are. This ensures that the status of the subject in the curriculum is maintained. This also takes into consideration the value of the teachers specialization. For this type of integration no special material or time is needed for the integration to be possible. If properly arranged for, the time allocated to each of the subjects can be saved. It goes without saying that if adopted such type of integration yields a high quality of understanding in students with very little ecomonic demands on the Ministry of Education.
Primary and Secondary

A number of factors which discourage integration of subjects have to be considered. Some of the factors which discourage teachers from integrating the teaching of subjects according to Tanner and Tanner(1975) are that secondary school teachers are trained as specialists and feel uncomfortable with other subjects where they might be seen to be incompetent. It would have been easier if they were specialised in two or more interrelated subjects. There is lack of readymade material for integration so teachers are faced by the challenge of treating the subjects as interrelated whilst using material for separate subjects. According to Hirst (1974) There is need to maintain subject boundaries as they are because of the characteristics of knowledge and the need to advance it.

These factors are common to different situations, but there is also a need to look into factors relevant to particular situations. The following factors have to do with how the Zimbabwean situation has prompted the choice of this particular type of integration as suitable for Zimbabwe. The Rhodesian government tried all possible means to prevent many young Africans from attending school. They reduced enrollment of young Africans and prevented church organizations from building more schools. This resulted in many young Africans being out of

school. Some of the young Africans left school to join the liberation war. Because of all this, by independence the number of young people out of school had risen quite a lot (Chikombah 1988). At independence, the ZANU(PF) 1980 manifesto pledged to establish free and compulsory Primary and Secondary education for all young people regardless of race.

According to Mackenzie (1985), the country's rural educational facilities had been destroyed by the civil war. During the colonial government educational financing of urban schools gave priority for white children schools. Under the above stated situation it can be seen that the ZANU(PF) educational promise Primary and Secondary met with a number of problems. Since 1980 the Ministry of Education has struggled to fulfil the promise made in the election manifesto. There has been a lot of school building, an enormous teacher training program and expatriate teachers have been employed in large numbers to supplement the teaching staff during the transitional period. At present, the educational system is moving towards more vocational /technical secondary education (Chikombah 1988). This is being done to provide students with skills, knowledge and attitudes which will enable them to work either in the public or private sectors, or be self-employed.

Bearing in mind all these factors it seems reasonable to consider the correlation type of integration since it;

(1) seeks to integrate the interrelated elements of subjects while maintaining the subject boundaries;
(2) places a very low economic demand on the Ministry of Education;
(3) seeks to maintain the present position and status of teachers yet;
(4) improving the understanding of students in both woodwork and science at secondary school level.

According to Tanner and Tanner (1971, p. 478) *the method of integration known as correlation makes an effort to develop certain common relations between or among two or more subjects* . Tanner and Tanner explains that this is done in an attempt to counter the isolation and division among subjects, without restructuring the curriculum. A teacher in a subject may work together with a teacher in another subject by letting his students do work which is related to that of the other teacher in trying to solve a practical problem. Integration through correlation may be developed between two separate subjects in the same field or those which are just closely relate. This method of integration is a significant attempt to articulate the subject matter of two or more different subjects, disciplines or fields.

1.7 Possible teaching arrangements

According to Tanner and Tanner (1971) The teaching of subjects by identifying the interrelated elements can be arranged for in a number of ways.

(1) A teacher may be responsible for two or more courses and attempt to relate these two subjects each time he teaches.
(2) Two teachers who have the same students but at different times may attempt to integrate the different elements of the subjects without altering the schedule.
(3) The two teachers may be scheduled at the same time so that they may combine their classes on occasions for team teaching. To be more systematic teachers could meet with combined classes in a block time.
(4) Teachers may divide classes occasionally or regularly according to treatment of topics or activities assigned to students.
(5) A single teacher competent in two subjects may work with a single class or group in block time or in two successive periods.

Tanner and Tanner (1971) identified factors which determine the extent to which integration could be attained by teachers as;
(1) the teachers' commitment to integration,
(2) the teachers' ability to identify common elements to subjects,
(3) the teachers' ability to work with others effectively when team teaching arrangements are made.

These factors Tanner and Tanner (1971) see as related to other factors limiting teachers from integrating the subjects. It can be observed that these two groups of factors affect each other. The limiting factors are that;
(a) secondary school teachers are always trained as specialists in certain areas,subjects or fields,
(b) there is lack of ready-made teaching material for integration,
(c) the teacher has the challenge of treating areas as interrelated.

1.8 Research objectives

In the study, an attempt was made to obtain sufficient information to make recommendations on one way of how the teaching of woodwork and science for Zimbabwe syllabus number 5006, could be integrated. To be able to come up with the recommendations on how the teaching of woodwork and science for Zimbabwe ordinary level syllabus number 5006 could be integrated it was found necessary,
(1) to analyse the "ordinary" level woodwork syllabus as well as the Science for Zimbabwe syllabus number 5006 in order to identify the common elements between the two subjects;
(2) to obtain information about the educational background and experience of teachers in terms of
    (a) years of teaching experience,
    (b) subjects in which teachers specialized,
    (c) any other studies taken after training as teachers,
    (d) years of experience teaching in the area of specialization,

(e) years of experience teaching in the area other than that of specialization,
(f) problems faced in situation (e) above and the way they were solved;

(3) to analyze the organization of the content for teaching in each case in terms of
   (a) time when certain parts of the syllabus are taught,
   (b) the effects on time when the parts of the syllabus should be taught of 1. administrative issues,
      2. availability of materials,
      3. public examinations,
      4. teachers' favourite topics,
   (c) time allocated to each subject in terms of periods per week,
   (d) recommended set books and reference books for each subject,
   (e) teaching aids and equipment required for teaching the common elements,

(4) to determine the flexibility in the use of human resources across the departments in terms of
   (a) frequency of inter-departmental meetings between the science and the woodwork departments,
   (b) the number of teachers found teaching in both departments,
   (c) teachers moving from teaching woodwork to teaching science or vice versa temporarily or permanently,
   (d) frequency of lesson observation by teachers across the two departments,

(5) to determine the flexibility in the use of physical resources across the departments in terms of
   (a) teachers' use of reference materials such as books, charts, etc. across the two departments,
   (b) teachers' use of other equipment like science apparatus and workshop facilities from the different departments for either teaching or preparation of lessons; and

(6) to establish the willingness of the teachers and Heads of Departments to integrate the subjects, and the opinion of the Headmasters and the subject Education Officers on integration of woodwork and science.

2. METHODOLOGY

The correlation type of integration has not been studied in Zimbabwe previously. In this context, the study must be regarded as exploratory. It should help to clarify concepts, obtain indepth information from people working in the field, and establish priorities for further research (Selltiz et al,1959). It was decided that the case study approach would yield the necessary information. As Mason and Bramble (1978) put it, by limiting the number of cases observed a large number of complex factors can be dealt with.

2.1 Subjects

The case is made up of three schools of the same type but at different levels of development. It is assumed that different factors relevant to the present study, represent different levels of advancement in the three schools. For example, at one of the schools, science is taught at "advanced" level while at one of the other schools the subject has just been introduced at the lower class of the "advanced" level. At the third school it is taught only up to "ordinary" level. At the school where science is taught at "advanced" level, the woodwork department is well enough equipped to be put on an experimental program for the vocationalization of woodwork. At the other two schools the woodwork departments are less well equipped to be put on an experimental program for the vocationalization of woodwork. Information from three schools widens the chances of obtaining a variety of opinions, useful insights and experiences of teachers and students on how interrelated elements in the two subjects can be linked.

The three schools are the earliest of a large number of schools built soon after independence. These three schools are in different areas of the same region. They have a similar administrative structure. They are all of the "hot seat" (i.e. two sessions with different sets of students are run per day)type of schools with streams from form one to four. The subjects of the study were Headmasters or Deputy Headmasters, Heads of Departments, and teachers of woodwork and science from the three schools. Form three students taking woodwork as their option were also subjects selected in order to obtain information about both woodwork and science. In addition, the technical subjects Education Officer and the Science Education Officer concerned were subjects of this study. Temporary teachers were left out because the researcher was looking for teachers with experience of teaching the two subjects after qualification. The subjects were selected so as to ensure representation of different types of experiences, and variation in points of view concerning the topic (see for example Selltiz et al,1959).

2.2 Instruments

The instruments chosen for this study were interviews, questionnaires and documents.

Interviewing was chosen as a method for data collection since it was found necessary to use a flexible instrument. Through interviews, the questions can be pursued, and elaboration or redefinition of the response can be asked for, all in an attempt to obtain comprehensive information.

The interviewee can be probed, misunderstandings and uneasiness can be seen, a check on the continuity in the flow of ideas or consistence in answers can be made along the interviewing process. This is done to ensure reliability of the information obtained (Wiersma,1969). Thus, interviews were suitable to obtain information from the teaching staff, Headmasters and Education Officers. (see appendices 1,2,3 and 4,)

The type of information required from students was fairly simple and straightforward. Consequently questionnaires (see appendix 5) were used to collect information from the students (Bell 1987).

Questions for both interviews and questionnaires were derived from the objectives. In order to analyze the organization of the content for teaching, questions were asked about textbooks, teaching aids and equipment, the time when certain parts of the syllabus are taught, allocation of time as well as effects on time of administrative issues, availability of materials, public examinations and teachers' favourite topics.

In order to determine flexibility in the use of human resources across the departments, questions were asked about the frequency of interdepartmental meetings between the science and the woodwork departments, the number of teachers found teaching in both departments, the transfer of teachers from science to woodwork and vice versa permanently or temporarily, the frequency of lesson observations by teachers across the departments and the use of teachers in subjects other than the ones they teach by students.

To determine flexibility in the use of physical resources across the departments, questions were asked about teachers' use of reference materials like books, teaching aids and equipment. Questions were also asked about the students' use of books across subjects. Instructions were provided in the cover letter of the questionnaire (see appendix 5).

To obtain information about the educational background of teachers, and Heads of Departments, questions were asked about their years of training, the subjects in which they specialized, other studies taken after training, years of

experience in teaching subjects of specialization and those in which they did not specialize, and problems faced in teaching subjects in which they did not specialize.

To establish teachers' and Heads of Departments' willingness to integrate woodwork and science and the opinion of the Headmasters and Education officers on integration of the two subjects, questions were asked on teaching the two subjects in a way which links the related elements in them, the advantages for the students of integrating the two subjects, scheming and arrangement for teaching to integrate the two subjects, problems which could be faced and their possible solutions if integration was done, how to evaluate the results of integration of the two subjects and the comparisons of advantages and disadvantages of integration of the two subjects.

2.3 Validity, reliability, and trial run

Since the objectives were already stated in operational terms, questions could directly be derived for the interview schedules and questionnaires (see appendices 1to5). This ensured that the content of the information which was to be yielded was according to the objectives and valid (Nisbet and Entwistle 1970).

The questions in both the interview schedules and the questionnaires were arranged in such a way that easier questions were started with and followed by the more demanding ones. No items were made identical to each other or dependent on each other. This was done to ensure reliability of the information to be collected. The type of questions used for the interview schedule were structured open-ended questions. Where a closed ended question was used, it was followed by a question which demanded explanation or clarification of something. This was done to prevent subjects from giving guessed responses which would undermine the reliability of the information collected. Fairly simple language was used for the questionnaire and questions could be clarified during the interview. This would ensure that the subjects understood the questions and the expected answer would be reliable (Helmstadter 1964).

A trial run of the interview schedules was done with fellow students who had at one time held posts corresponding to those of the subjects. This was done to identify misunderstandings, ambiguities, and inadequate items. No revision of the questions on the interview schedule was necessary since the subjects had no problems in understanding and responding accordingly.

Students' questionnaires were sent for a trial run in Zimbabwe at one of the schools where the research was to be carried out. This was done to test the time which a student would take to complete a questionnaire and to check that all questions and instructions were clear. This would enable revision of the unclear

items and instructions (Bell 1987). The questionnaires were administered to a class of form three students. Additional instructions were given by teachers who were asked to help administer the questionnaires (Helmstadter 1964).This class was later on excluded from the list of subjects of the study from this school. Revision of the questionnaire items was not necessary since the students had no problems in understanding the questions and responding to the items.

2.4 Procedure

Preparation for data collection in schools and concerned departments was done by the University of Zimbabwe. This was done by seeking permission from the Ministry of Education. The schools and departments where collection of data was supposed to take place were contacted.

They were asked to cooperate, informed of the dates when the information would be collected, what departments would be involved and what the research was all about.

The researcher started by phoning the selected schools and departments to make the necessary appointments with the Heads of the schools and the officials of the respective places. At each of the schools the researcher presented a letter of introduction issued by the University of Zimbabwe (see appendix 6) and further explained the purpose of the research. In each school the Headmasters assisted in making the necessary appointments with Heads of Departments and teachers in both the science and the woodwork departments. The purpose of the research was explained to all subjects and they were ensured that the interviews would be treated confidentially.

The subjects in the science department were interviewed before the subjects in the woodwork departments. In each department Heads of Departments were interviewed before teachers. The final interviews at each school were conducted with the Headmasters.

Of the possible subjects in the three schools there was only one non-response. This was one Head of Department who was engaged in other matters at the time of the appointments. In all, three Heads of Departments in science and two in woodwork were interviewed. Each interview took about forty-five minutes. Eleven science teachers and five woodwork teachers were interviewed. These interviews took approximately thirty-five minutes, because there were fewer questions. Finally, interviews with the three Headmasters took on average twenty minutes each.

The questionnaires for the students were administered by one of the teachers. This was done to all form three students present at the time of the study at each school except for those who had been used for the trial run of the

questionnaires. The teachers were instructed to advise the students to read the instructions in the cover letter carefully before they started to respond to it. The teachers were also instructed to help the students in explaining parts of the questionnaire should the students not understand. The questionnaires were handed out, filled in and collected at the same time.

At the Regional Education Office in question the researcher presented a letter of introduction issued by the University Of Zimbabwe to the Deputy Regional Director for secondary schools. The researcher then further explained the purpose of the research to The Deputy Regional Director who then assisted by introducing the researcher to the Education Officer for science and the Education Officer for technical subjects.

When interviewing each of the Education Officers, the purpose of the research was explained to them. Then the Education Officers were ensured that the interviews would be treated with confidentiality. The science Education Officer was interviewed first followed by the education officer for technical subjects. The interviews took about twenty minutes each.

3. PRESENTATION OF RESEARCH FINDINGS

The results will be presented as a range of matters that will facilitate or constitute obstacles to integration. The presentation will start with the background information of the teaching staff . This will be followed by the result of the analysis of the ordinary level science and woodwork syllabi and finally information about the different factors which were considered important to ask about.

3.1 Qualifications and Experience of school teaching staff

This part of the description is concerned with the second objective, which concerns the qualifications and experience of teachers and Heads of Departments. The qualifications and experience of the teaching staff have a bearing on the matter of integration. These persons are also the subjects yielding the information for factors to be presented later so it is necessary to present these subjects at this starting point.

In table 3.1 the educational qualifications of the Heads of Departments and teachers are presented. The qualifications are given in terms of the highest qualifications which the Heads of Departments and the teachers had at the time of data collection.

Two of the schools only have qualified woodwork teachers but temporary teachers are provided for science. The other school has temporary teachers for woodwork as well. The temporary teacher may have studied woodwork at secondary school.

Some of the science teachers and a few of the woodwork teachers have studied their subjects at "advanced" level. Some of these have done this to improve their understanding of the subjects they teach so that they can teach them better. Some have done the studies because they intend to move out of the teaching profession.

Table 1. A table showing the educational qualifications of the teaching staff

POSITION	NUMBER	HIGHEST QUALIFICATION
Heads of Departments (WW)	2	Certificate in Education
Head of Department (Sc)	1	Bachelor of Science (Honours)
Head of Department (Sc)	1	Certificate in Education
Head of Department (Sc)	1	Bachelor of Education
Teachers (WW)	2	Certificate in Education
Teachers (WW)	3	Woodwork Craft Certificate
Teachers (Sc)	5	Bachelor of Science (Honours)
Teachers (Sc)	6	Certificate of Education

Table 2. A table showing the number of years of experience of the teaching staff

EXPERIENCE	NUMBER	POSITION
1-4 years	7	Science Teachers
	1	Science Head of Department
	1	Woodwork Head of Department
	1	Woodwork Teacher
5-8 years	3	Woodwork Teachers
	1	Science Head of Department
	3	Science Teachers
9-12 years	1	Woodwork Teacher
	1	Science Head of Department
13-16 years	1	Science Teacher
21 years	1	Woodwork Head of Department

The experience which the teaching staff members have ranges from 1 to 21 years of experience. All (see Table 2) the teaching staff belong to one department only, but some teachers have at one time taught other subjects than the ones they specialized in. Such subjects are Mathematics, English, Shona and Religious knowledge.

Problems encountered by teachers when they taught subjects in which they did not specialize are that;

(a) they could not teach the subjects to the required depth;
(b) some teachers could not relate the material taught to real life situations;
(c) teachers would use inappropriate teaching methods. This may result in a poor quality of learning ;
(d) unqualified teachers lack commitment to the subject and were said not to prepare for their lessons adequately;
(e) these teachers would use more time teaching a topic than the specialize teachers would.

The solutions to the above mentioned problems were perceived to be that;
(1) teachers should study the subject matter as well as the teaching methods for the subject in depth;
(2) teachers should consult other teachers on methods of teaching the subject;
(3) staff development programs should be used to help teachers acquire better teaching methods;
(4) teachers should be given more time to plan;
(5) teachers should prepare for their lessons thoroughly;
(6) Heads of Departments and senior teachers should provide teachers with guide-lines for teaching the subjects.

Conclusion
The teaching staff have such qualifications as certificate of education in woodwork metalwork, and some certificate of education in science. Some have a woodwork craft certificate. Some of the science teaching staff have a Bachelor of Science Honours degree.

Most woodwork teachers in the school are qualified or at least have studied woodwork at secondary school level.

Some teachers have studied subjects which they teach at "advanced" level in order to improve their teaching performance.Teachers' experience range from 1 to 21 years of teaching. Some teachers have taught other subjects than those in which they specialized but there is not much flexibility in the use of teachers to teach other subjects.

There are problems met by teachers who teach subjects other than the ones in which they specialized.

3.2 Analysis of the "ordinary" level woodwork syllabus and the science for Zimbabwe syllabus number 5006

The analysis of the "ordinary" level woodwork syllabus and the science for Zimbabwe syllabus number 5006 concerns the first objective. The analysis was

done in order to identify the common elements in the two syllabuses by taking woodwork as the point of departure and searching for science elements which are related to particular woodwork elements. The topics in the woodwork syllabus have been dealt with in the sequence in which they appear. The science topics have been dealt with in relation to the sequence of the woodwork topics.

The 1990 woodwork syllabus and the 1989 science syllabus were used in this analysis. Woodwork and science set books have also been used to yield the specific elements of the subtopics found in the syllabuses.

In the woodwork syllabus, there is a topic "Timber". This topic has a sub-topic "characteristics of softwoods and hardwoods in common use and their suitability for particular purposes". In the science syllabus there is a similar sub-topic found under the topic "Science in structures and mechanical systems". This sub-topic is "Properties of materials". One of the materials dealt with is timber and the first element is natural timbers. In the set book for science, "Science in Zimbabwe" by Bethell et al (1987), this element is further divided into wood as a material, classification of wood, softwood and hardwood and properties of wood. It can be observed that the elements dealt with in the science syllabus are very similar to those dealt with in the woodwork syllabus.

A second sub-topic of Timber in the woodwork syllabus deals with "the growth of timber". In the woodwork set book "The theory and practice of woodwork" by Love (1987), this sub-topic is further divided into a number of elements. The elements are; the general structure of wood, that is, parts of wood which he further breaks down to smaller elements like the pith, annual rings, heartwood, sapwood, cambium layers, bast or phloem, cortex, bark and rays, and the structure of softwood and hardwood. In the science syllabus one sub-topic compares to this. The sub-topic "plants", which belongs to "Science in Agriculture", has such elements as growth patterns in trees and herbs, growth rates in indigenous and exotic timber trees, effects of light ,water, and temperature on growth of trees. The notes for guidance given in the syllabus state that the students are supposed to examine the cross section of trees, carry out investigations on the the growth rates of local trees like musasa and exotic trees like blue gums. They are also supposed to plot graphs of the rate of the growth of trees.

A third sub-topic of the topic Timber is on "conversion and seasoning of timber" which also looks at simple moisture testing. The notes for guidance in the woodwork syllabus emphasize the use of experimental and comparative methods for moisture testing. In the topic "Science in structures and mechanical systems" there is a sub-topic which is similar to the sub-topic in woodwork which deals with seasoning and curing of wood.

A fourth sub-topic of Timber deals with simple strength materials testing. According to the notes for guidance it is stated that emphasis be put on

comparative and mechanical strength of timber along and across the grain. This sub-topic compares with the sub-topic mechanical properties of materials which is part of "Science in structures and mechanical systems" of the science syllabus. In the set book of science, "Science in Zimbabwe" by Bethell et al(1987) this sub-topic is further divided into such elements as man and materials, strength of materials i.e. tensile strength and compression strength, stiffness of material and porosity.

A fifth sub-topic of Timber "timber products"deals with such elements as plywood, laminated board, and manufactured board, hardboards and plasticfaced boards. This sub-topic compares with a sub-topic "processed timbers"in the topic "Science in structures and mechanical systems". The elements dealt with in processed timbers, are laminated pine plywood, blockboard, and chipboard.

A sixth sub-topic of Timber deals with bending in simply supported beams. This content can also be found in the woodwork topic "Carpentry". This topic deals with simple roofs and covering and has the element roof trusses. The notes for guidance in carpentry emphasizes that pupils should take part in actual roofing whenever possible. There is yet another topic in the woodwork syllabus called "Wood technology". This deals with elements like simple structures and factors which affect their rigidity. There is a sub-topic in "Science in structures and mechanical systems" which compares with the above mentioned sub-topics concerning beams. The science sub-topic is further divided into a number of elements in the set book "Science in Zimbabwe" by Bethell et al (1987). The elements dealt with are simple beams, loading of beams, and joining of beams. Another sub-topic in the same topic deals with trusses with an extra panel, trusses with several panels, joining of trusses using gang nails, and stress patterns.

There is a topic in the woodwork syllabus "Construction" which deals with joining of wood.This topic deals with such elements as glues and other adhesives, use of nails and screws. A similar sub-topic is found in "Science in structures and mechanical systems"in science. This topic deals with joining of beams by mechanical means like nails bolts and rivets and also by gluing. In Bethell et al(1987) this sub-topic is further divided into such elements as strength and efficiency of joints, and scart joints in timber.

A second sub-topic of the topic technology in woodwork deals with how different woodwork tools function. This sub-topic compares with sub-topic of "Science in structures and mechanical systems" which deals with machines. Elements dealt with are such things as force and weight, work, levers like a pair of pincers,a claw hammer a screw, and simple machines like pulleys, a wheel barrow etc. The efficiency of machines is also dealt with.

Conclusion

From the above analysis it can be said that there are elements in the "ordinary" level woodwork syllabus and science for Zimbabwe syllabus number 5006 which are related to each other. The relationship is such that the topics, or sub-topics ;

(1) deal with the same elements, the main difference being that different emphasis is put on the same elements in the two subjects. In science emphasis is placed on enquiring and discovering the behaviour of different things. In woodwork emphasis is put on the use of the same things considering their characteristics.

(2) explain what the other topic in the other subject is dealing with. In this way the elements supplement on the knowledge dealt with in the other subject. Through integration a complete meaning of the idea about the element can be obtained.

3.3 The organization of content for teaching

This part of the description is concerned with the third objective which is to analyse the organization of the content for teaching.

The subjects yielding information concerning this objective were three Headmasters, two Heads of Departments of Woodwork and three of Science, five woodwork teachers, eleven science teachers, the E.O.* Science and the E.O.Technical Subjects at the Regional Education Office concerned .

Looking at information obtained concerning the organization of content for teaching, it can be said that in woodwork, the teachers have freedom to choose when to teach certain topics of the syllabus. The time when these topics are taught is actually agreed upon by a group of woodwork teachers who sit together to make a school syllabus from the national syllabus. The main factor which they consider as they make this syllabus is that of the structure of knowledge. They arrange the topics starting with simple knowledge and basic skills followed by complex knowledge and demanding skills.

It can also be said that the organization of content for teaching can be affected by the availability of materials. Public examinations are also said to have an effect on the order in which the elements can be taught. As for the teacher's interest in certain topics,it does not seem to have any effect on the sequence in which the topics are taught.

Responses on the organization of the content for teaching of science seem to indicate that science teachers do not have total freedom of when to teach certain topics. The order in which the topics should be taught is determined more by the Curriculum Development Unit and is not flexible. The Curriculum Development Unit in making the order of topics considers the average climatic

* E.O. = Education Officer

conditions and the general environmental conditions in Zimbabwe. They also consider the structure of the knowledge they are dealing with. They start with simple basic knowledge about concrete things and then go on to the complex and more abstract knowledge.

Conclusion

When it concerns the organization of the content for teaching in the two subjects it is found that there is a difference between the staff. It can be said that the sequence of the topics in the woodwork syllabus is perceived to be flexible whilst that of the science syllabus is not. Furthermore, the availability of materials as well as public examinations are perceived to have an effect on the sequence in which different topics are taught in both subjects. In neither subject is the teachers' interest stated as influencing the organization of the content for teaching.

3.4 Flexibility in the use of human resources

This part of the description is concerned with the fourth objective which is to determine the flexibility in the use of human resources across the departments. All the subjects who gave information about the second objective also provided information about this objective.

It can be said that Heads of Departments do observe teachers' lessons. This is done as part of their duty. They do this to find out how teaching is going on within the department so that they can help in giving advice where it is necessary. This is done to ensure that proper methods of teaching are used.

The majority of the teachers do observe other teachers' lessons within the department. They feel that this can help them to learn different methods of teaching different topics. This they see as if it may improve their method of teaching. There is a feeling that it also makes teachers who do not normally prepare for their lessons to prepare for the lessons which are to be observed, which may result in the teachers falling in the habit of preparing for lessons most of the times. Whilst it is like that there is a general feeling among teachers that they tend to feel uneasy when teaching in the presence of other teachers. This, they said, could be because they perceive the other teachers as observing the lessons in order to evaluate the observed teacher's lesson. This results in making the observed teacher nervous as he teaches, which tends to disrupt the lesson. Another reason for teachers not being in favour of lesson observation is that they do not like criticisms of their teaching methods.

Observation of lessons in other subject is not done by all teaching staff because they feel that they may be taken as intervening with their fellow teachers' work.

Another reason is that of teachers feeling uneasy to teach in the presence of other teachers even though the teacher observing may not be a specialist in the subject being observed. This results in making the observed teacher nervous as he teaches, which tends to disrupt the lesson. A teacher who is observing the lesson of a subject which he is not very familiar with may feel out of place as he observes the lesson.

The teaching staff expressed a feeling that observing lessons in other subjects would help them to learn how to teach certain topics of the other subjects. This they said would be of an added advantage if the topics being observed were related to certain topics in the subject which the observer teaches.

When it concerns team teaching the majority of the subjects felt that it is a favourable thing to do. They felt so because they think that through it, teachers combine their efforts in teaching to make the students understand better. Whilst it is like that there are problems perceived by the majority of the subjects which are as follows;

(a) some teachers may not fully prepare for lessons, which may affect the hard-working teachers in that they would end up not working hard any more;
(b) teachers may feel uneasy to teach in the presence of other teachers because of lack of competence in the topic they are teaching;
(c) some teachers do not want to accept that they can learn from other teachers.This makes them not to be fully committed to the team teaching which would be taking place;
(d) students are exposed to a large number of teachers and would take a long time to get used to all of them. This tends to establish a weak student teacher relation which would affect the quality of learning;
(e) when pupils are mixed, fast learners tend to participate more than slow learners in the activities taking place, they would then learn more through participation than the slow learners. This makes fast learners benefit more from team teaching than slow learners;
(f) students tend to evaluate teachers. Through this evaluation students may develop different attitudes towards different teachers. This becomes a problem when the students develop negative attitude towards their own class teacher;
(g) with "hot seat" systems being practised in schools, there may not be enough time to exercise team teaching since the time table is filled with activities;

When it concerns movement of teachers from one department to the other either on a temporary or permanent basis, teachers have not been asked by any authority to do so. As for belonging to more than one department, there is a feeling that teachers can belong to more than one department as long as they have one main department to which they belong.

As for woodwork teachers teaching science and vice versa for science teachers, the authorities in the different subjects felt that it is not a favourable thing to do. This they say may lead to a superficial teaching of the subject. Also the fact that teachers have different attitudes towards different subjects, may affect the effort they put into the different subjects.

The majority of the woodwork teaching staff felt that they could perform poorly if they were asked to teach science. There is a feeling in some of them that they might perform well only in parts which are related to woodwork. The majority of the science teaching staff felt that they could perform well only in parts which involve material science.

It was perceived that problems can be met when teaching a subject other than the one for which one is trained which may either be woodwork or science. The following problems were stated by the subjects;

(1) teachers would not teach the subject to the required depth;
(2) teachers would not be able to use the right terms;
(3) teachers would use improper teaching methods;

The perceived solutions to the above mentioned problems were such things as;

(a) that teachers study the subject matter as well as the teaching methods of the subject;
(b) that teachers practise woodwork skills through the assistance of the woodwork teachers;
(c) that teachers learn teaching methods from other teachers through staff development programs;

When it concerns departmental meetings, generally two to three meetings are held per term. As for interdepartmental meetings, two meetings with all Heads of Departments are held in each school per term. It was generally expressed by the majority that interdepartmental meetings were necessary especially if they could involve teachers as well. It was indicated by some subjects that the interdepartmental meetings were not necessary whilst others indicated that what was unnecessary was the idea of including teachers in the meetings.

There was an agreement between issues which were actually discussed in inter-departmental meetings by Heads of departments and those which teachers said should be discussed at such meetings. These were as follows;

(a) the identification and teaching of elements common to different subjects;
(b) the ordering of enough equipment and materials which are shared among departments and used for teaching of common elements;
(c) helping of students to solve their academic problems like examination techniques and preferable subject options;
(d) the handling of books, equipment and materials shared amongst departments;

(e) sharing of ideas concerning teaching in general;

Conclusion
When it concerns the observation of lessons, the teaching staff observe lessons within the same department. This is to ensure that teaching is done properly, or to acquire alternative methods of teaching a topic in an attempt to improve ones methods of teaching.

But there is no effort to acquire methods of teaching certain topics from other teachers in other departments. This is because teachers fear that they would be taken as intervening with other teachers' work in other departments. There is a general feeling amongst teaching staff members that if they observed lessons in other subjects they would acquire knowledge on how certain topics in these subjects are taught. This they realize as being of an added advantage if the topic taught is related to a topic in the subject which the observing teacher teaches.

Team teaching was seen as a favourable thing to do because if done it would enable teachers to combine their effort in trying to make students understand what they are taught better. But no team teaching is done.

Subject officials feel that science teachers should not be asked to teach woodwork or woodwork teachers to teach science. Woodwork teachers indicated that they would not perform very well if they were asked to teach science. On the other hand science teachers felt that they could perform well if they were asked to teach the parts of woodwork which are related to science.

Interdepartmental meetings are held but teachers are not included in these meetings. But these teachers have ideas which they feel can be discussed at interdepartmental meetings.

In summary it can be said that there is no flexibility in the use of human resources.

3.5 Flexibility in the use of physical resources

This part of the description is concerned with the fifth objective which is to determine the flexibility in the use of physical resources across the two departments.

3.5.1 Flexibility in the use of physical resources by the teaching staff

This part of the objective is concerned with the flexibility in the use of the physical resources by the two Heads of Departments, three science Heads of Departments, five woodwork teachers, and eleven science teachers in the three schools.

Woodwork

When it concerns set books, there are set books for both woodwork and science. These set books were, according to the majority of the science and woodwork teaching staff, available when they were supposed to be used only that they were in short supply. The majority of the teaching staff uses other books than the set books daily, to supplement on the knowledge they obtain from the set books. The other teachers said they did not use any other books than the set books. All the Heads of Departments expressed the view that the use of other books than the set books was favourable.

As for the use of books from other subjects, a few of the teaching staff said they did not use books from other subjects because there was not enough time to deal with the extra material. So this was done in order to limit the amount of work to be covered. The majority of the teaching staff said that they did use books from other subjects as their reference books.The woodwork staff used these books twice or three times a year whilst the science staff used the books each time they were dealing with a topic related to another subject. They said that they used the books from other subjects because it helps the teacher to deal with the concepts he is teaching from various angles, i.e. scientifically, practically, and in a way which relates subjects to real life situations. All teachers seemed to favour the idea of using other books than the set books as they said it widens the knowledge of the concept they are to teach.

When it concerns flexibility in the use of equipment and apparatus, some teaching staff improvised on the equipment and apparatus used for teaching science and woodwork. Some teachers stated that equipment was made available by a borrowing system which was set up in the schools of that area. As for borrowing equipment within the school, the majority of the woodwork teaching staff did not borrow equipment. This they said was because the other departments did not have the type of equipment they would need. Some of the woodwork and very few science teaching staff did borrow equipment only when a need for special equipment arose. They did this because they did not have enough equipment. The woodwork teachers stated that they had borrowed equipment from the metalwork department.

The majority of the science teaching staff had borrowed equipment from the woodwork, metalwork, food and nutrition, fashion and fabrics, agriculture and geography departments. These, they said, are the departments which have the appropriate equipment for some of the topics they dealt with. The other reason given was that parts of the science syllabus are related to the subjects taught in these departments.

Conclusion

When it concerns the availability of textbooks, the textbooks were made available when they were needed but were not adequate in number. The majority of the teachers use other books than the set books within the subject.

This is done to supplement on the knowledge in the set books. Some of the teachers go to the extent of using books from other subjects.

The majority of the science teachers borrow equipment from the woodwork, metalwork, fashion and fabrics, food and nutrition and agriculture departments. This shows that there is flexibility in the use of equipment. These teachers see the equipment used for teaching these other subjects as being appropriate for teaching their own subjects. It can be said that there is a certain amount of flexibility in the use of physical resources among teachers.

3.5.2 Flexibility in the use of physical resources by students

This part of the description is concerned with flexibility in the use of physical resources by students. The subjects concerned were one-hundred and thirty-two form three students taking woodwork as their option in the three chosen schools.

When it concerns the availability of woodwork and science textbooks, 90 out of the 132 (68.2 %) students, felt that there were not enough textbooks for the core science syllabus and 95 (72 %) of them felt that there were not enough textbooks for woodwork (see table 3.3). However, almost all the students felt that textbooks were necessary for the woodwork and core science courses they were taking.

Table 3. A table showing number of students' indication of availability of woodwork and science text-books

TEXTBOOKS ADEQUATE	WOODWORK		SCIENCE	
	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE
YES	42	31.8 %	37	28 %
NO	90	68.2 %	95	72 %

When it concerns the most important sources of information for both science and woodwork, the following indications were made; books were indicated as the most important source of information for science by 84 (which is 70.5 % of the) students and for woodwork by 87 (which is 71.3 % of the) students. Teachers' notes were indicated as the most important source of information for science by 20 (which is 16.8 % of the) students and for woodwork by 21 (which is 17.2 %) students. Lessons were indicated as the most important sources of information for science by 15 (which is 12.6% of the) students and for woodwork by 14 (which is 11.5% of the) students. Friends and other sources of information were not indicated by any student as the most important sources of information. There were 13 non-responses for the responses on the most

important source of science information and ten non-responses for woodwork information (see table 3.4 and 3.5).

There is complete agreement between the most important sources of woodwork and science information. Should the Spearman's Rho be computed the differences between the rank orders would be 0 and the final coefficient accordingly be1.0.

Table 4. A table showing students' indication of the most important source of science information

THE MOST IMPORTANT SOURCE OF SCIENCE INFORMATION	NUMBER OF STUDENTS WHO INDICATED	PERCENTAGE OF STUDENTS WHO INDICATED
BOOKS	84	70.6 %
TEACHERS' NOTES	20	16.8 %
LESSONS	15	12.6 %
FRIENDS	0	0 %
OTHER SOURCES	0	0 %
TOTAL OF RESPONSES	119	100 %

Table 5. A table of students' indication of the most important source of woodwork information

THE MOST IMPORTANT SOURCE OF WOODWORK INFORMATION	NUMBER OF STUDENTS WHO INDICATED	PERCENTAGE OF STUDENTS WHO INDICATED
BOOKS	87	71.3 %
TEACHERS' NOTES	21	17.2 %
LESSONS	14	11.5 %
FRIENDS	0	0 %
OTHER SOURCES OF INFORMATION	0	0 %
TOTAL RESPONSES	122	100 %

When it concerns the use of science textbooks for woodwork or woodwork textbooks for science, 37 out of the 132 (which is 28 % of the) students indicated that they had used science textbooks for woodwork but the rest had not. Out of the same number, 32 (which is of 24.2 % of the) students indicated that they had used woodwork textbooks for science but the rest had not (see table 3.6)

There were 5 non-responses for the responses on the use of science textbooks for woodwork and all students responded to the question on the use of woodwork textbooks for science.

Table 6. A table showing the number of students who indicated that they had used either science textbooks for woodwork or woodwork textbooks for science

RESPONSES GIVEN	USED SCIENCE TEXTBOOKS FOR WOODWORK		USED WOODWORK TEXTBOOKS FOR SCIENCE	
	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE
YES	37	28 %	32	24.2 %
NO	90	72 %	100	75.8 %

As for teachers' encouragement of students to use other books for their science and woodwork homework and exercises, 55 out of the 132 (which is 41,7%) students felt that they were encouraged by their science teachers to use other books for science homework and exercises. Out of 132 students (51 which is 38.6 %) felt that they were encouraged by their woodwork teachers to use other books for woodwork homework and exercises.

When it concerns students asking woodwork teachers for clarification of something in science or vice versa, 38 out of132 (which is 28.8 %) students indicated that they had gone to a woodwork teacher to have something clarified in science and 42 (which is 31.8 %) had gone to a science teacher to have something in woodwork clarified.

Conclusion

It can be said that there are not enough textbooks for woodwork and science in the schools. But students feel that books are necessary for both. Most students feel that books are the most important source of science and woodwork information while some feel that teachers' notes and lessons are the most important source of information. A few students use science books for woodwork or woodwork books for science. It can be said that there is inflexibility in the use of books across subjects by the students.

A few students go to the science teacher to have something in woodwork clarified or to a woodwork teacher to have something in science clarified.

3.6 Willingness of school staff to integrate the subjects

This part of the description is concerned with the sixth objective. This objective was intended to establish the willingness of the teachers and Heads of Departments to integrate the two subjects. It was also intended to establish the opinion of the Headmasters and Education Officers concerned on integration of woodwork and science. All subjects who gave information about the second objective also yielded information concerning this objective.

When it concerns the teaching staff's familiarity with the contents of the syllabus of the subject other than the one taught, it seems as if the majority of the woodwork teachers and their Heads of Departments are not familiar with the science syllabus. The only woodwork teacher familiar with the science syllabus has science as one of his subjects of specialization. The majority of the science teaching staff are familiar with those parts of the woodwork syllabus related to science. As for making comparisons between the science and the woodwork syllabuses only the science teacher who specialized in both woodwork and science had made comparisons. The rest of the teaching staff had not. The science teacher who made the comparisons discovered that some elements are related to each other. He also found that parts of one subject were a prerequisite for certain parts of the other subject.

When it concerns the teaching staff's ideas of what the other subject emphasizes, all woodwork staff felt that science emphasizes the carrying out of experiments in an attempt to teach the behaviour of things in the environment. The majority of the science teaching staff said that woodwork emphasizes the making of articles from wood which can be utilized in homes. The remaining science teachers felt that woodwork emphasizes the designing of articles, making of drawings of the article, and finally making the articles from wood.
They added that as students do this they acquire skills and knowledge of working with wood and also improve their creative ability.

The majority of the subjects felt that teaching related elements of the two subjects in a way which links them would be a good thing to do. It was generally felt that if this was done, students would have a better understanding of the material learnt. They would also learn to apply knowledge learnt in different subjects to different situations. Some even added that students would become more enquiring and creative in their process of learning. To the contrary one science teacher felt that it was not favourable to link the related elements of different subjects. The reason given was that the elements taught might become too monotonous and therefore less interesting.

When it concerns making arrangements for teaching the interrelated elements in a linked way, the majority of the subjects felt that teachers should hold meetings in which they would discuss and familiarize each other with the contents of the syllabuses. Common elements would then be identified. Teachers from the other subjects would choose topics which they feel they can competently teach. Teachers from the different areas would then agree on when to teach the related elements. The flexible parts of syllabuses of some subjects would be moved towards those of the subjects which are not flexible. The other feeling expressed was that of the teachers having to scheme in a normal way. The teachers would link the related elements in their subject areas. Some felt that the teaching of the whole subject can be done by the subject teachers but teaching related elements at the same time and making attempts to link the related elements in the different subject areas. A suggestion was also made that the syllabus for science be made flexible to enable movement of related elements to be taught about the same time.

It was also felt that teachers, who will have chosen the topics in which they think that they are competent from the other subjects should be invited to teach the topic when the time for dealing with the topic comes up.

Some felt that subject teachers should enquire from other teachers on how to teach certain topics and seek to integrate the elements on their own.

The problem perceived to be likely to be encountered in attempting to integrate the two subjects were those of some teachers having a feeling that science is superior to woodwork. This might make science teachers less motivated to integrate. Some teachers may also be incompetent in the other subject and so may end up teaching it at a superficial level. Teachers may not fully prepare for lessons which involve integration, and may also end up teaching it at a lower level than the one expected. If teachers are invited to teach the lesson at a place unfamiliar to them like the laboratory or the woodwork-shop they may feel out of place. This may affect their method of teaching the subject. There is not enough time to integrate the subjects because of the "hot seat" system and the fact that teaching is aimed at making students pass public examinations. Examinations tend to make teachers concerned more about finishing the syllabus on time. Material ordered in departments is not sufficient for the integration of the related elements. In an attempt to integrate, teachers may use improper methods of teaching which may affect the students' under-standing of the material taught. There is lack of teachers who can link the elements. Classes are very large, which may mean a lot of work for a teacher as he prepares for lessons. This may lower the quality of the teaching which can be achieved.

There were a number of solutions to the above stated problems which were posed by the subjects. It was generally felt that teachers should read widely on the subject matter as well as methods of teaching the subjects. Teachers should

also prepare for the lessons adequately for which they also need to be given more time. Streams should be made according to the options which students have. This will enable the composition of classes with the same subject options. Teachers should teach their lessons either in the laboratory for science teachers or in the workshop for woodwork teachers rather than being invited to an unfamiliar place. Examinations, should include questions on integrated elements. More teachers should be trained and the training should emphasize on the integration of subjects.

More equipment, textbooks, and materials necessary for integration should be made available. Teachers should take care of the material which is used for teaching so that it may last longer. Teachers should be made to realise the importance of treating all subjects as equal, as compared to having the idea of the hierarchy of subjects. In-service training and staff development programs should be made use of in the exchanging of ideas on teaching in general. In order to economize on time, arrangements should be made in such a way that lessons are not duplicated.

When it concerns the evaluation of the results of integration, it was generally felt that questions on the integrated elements should be used in written, oral and practical examinations, tests, and exercises. It was also felt that a research should be carried out to investigate the effects of integration of woodwork and science on the students understanding of the two subjects.

Conclusion

When it concerns familiarity with the syllabus of the subject other than the one in which the teacher specialized the majority of the woodwork teaching staff are not familiar with the contents of the science syllabus. There was one woodwork teacher who was familiar with the science syllabus since he specialised in teaching both woodwork and science. Whilst it is like, the majority of the science teachers are quite familiar with the parts of the woodwork syllabus which are related to science. As for making comparison of the syllabuses, only the teacher who specialized in both woodwork and science has made a comparison between the woodwork and the science syllabuses. According to him, some of the elements of the woodwork syllabus are related to those in the science syllabus. Furthermore, parts of one subject are prerequisites for parts of the other subjects.

As for ideas held by teachers about the emphasis of the other subject than the one they teach, woodwork teachers look at science as putting an emphasis on the carrying out of experiments. This they said, is done in an attempt to teach the behaviour of things in the environment.

As for the majority of the science teachers, they look at woodwork as emphasizing the making of articles from wood which can be utilized in the homes. Some of the science

teaching staff said woodwork emphasized designing and making of

working drawings of articles. The students make the articles from wood as they learn about wood, how to use it in making articles and improve their creative ability.

Generally all teaching staff members, all Headmasters and Education Officers expressed that there were more advantages than disadvantages in integrating woodwork and science.

In order to scheme for the integrated teaching of subjects, teachers should hold meetings. In these meetings they should discuss and familiarize each other with the contents of the syllabuses. Common elements would then be identified and teachers from the other subjects would then choose elements which they feel that they could competently teach. An arrangement would then be made on when to teach the related elements. The flexible parts would be moved to those parts which are not flexible. It was also suggested that teachers would scheme in order to do the teaching in a way which integrates the ideas from both subjects. . The teacher would enquire from the other teachers how to treat elements he might not be sure of. Another possibility given was that of making the science syllabus more flexible . This would enable the movement of the elements in the science syllabus to be taught at a time when a related element in woodwork would be taught.

As for the teaching of the topics in an integrated way, it was suggested that teachers who would have chosen the topics would then be invited to teach the topics. Another possible way was that of the teachers doing all the teaching for themselves. The teachers would have to enquire from other teachers where it would be necessary. Yet another possible teaching arrangement suggested was that of teachers having to do all the teaching on their own but making an attempt to teach related elements at the same time. They then would link the ideas as they teach these elements. There are problems which were perceived as related to integration, but solutions to these problems were also suggested.

4. DISCUSSION

4.1 Summary Of Results

It can be said that there are elements which are related to each other in the "ordinary" level woodwork syllabus and science for Zimbabwe syllabus number 5006. The relationship between the topics, or subtopics of the two subjects are that they ;

(1) deal with the same elements, the main difference being that different emphasis is put on the same elements in the two subjects. In science emphasis is placed on enquiring and discovering the behaviour of different things. In woodwork emphasis is put on the use of the same things considering their characteristics.

(2) give an explanation of what the other topic in the other subject is dealing with. In this way the elements supplement the knowledge dealt with in the other subject. Through integration, a complete meaning of the idea about the element can be obtained.

It seems as if there is a difference in the flexibility of organization of the content for teaching of the two subjects. The woodwork syllabus seems to be flexible in a way that the teacher has freedom to choose when to teach a topic. The science syllabus is not perceived as flexible, so the teachers follow the sequence in which the topics come in the syllabus. The availability of materials and public examinations can affect the sequence in which the topics are taught in both cases. The organization of the content for teaching is not influenced by the teachers' interest in either case.

The teaching staff observe lessons within their department. Some observe lessons to ensure that teaching is done properly whilst others do it to acquire alternative methods of teaching certain topics. The teaching staff members do not observe lessons in other subjects. This is because they feel that they may be taken as intervening in other teachers' work. However, the majority of the teaching staff expressed the feeling that if they did observe lessons they would acquire knowledge about the teaching of topics in other subjects. They felt it would be of an added advantage if the topics observed were related to elements in the subjects they taught themselves. There is no flexibility in observation of lessons across the departments.

Team teaching was taken to be favourable in that it enabled students to better understand what they are taught but it is not practised.

There is no temporary movement of teachers from one department to another. But, some teachers have occasionally been asked to teach other subjects. This is an indication of inflexibility in the use of teachers in other subjects than the ones in which they specialised. Subject officials feel that science teachers should not

be asked to teach woodwork or woodwork teachers to teach science. Woodwork teachers feel that they cannot teach science whilst science teachers feel that they can teach those parts of woodwork which are related to science.

Interdepartmental meetings are held but only heads of departments attend . Teachers are not included in the meetings but have ideas they feel could be discussed.

Set books were made available when they were needed but the supply was inadequate. Most of the teachers consult other books than the set books to supplement on their knowledge. Some teachers even consult books from other subjects.

Students also indicated that the books are inadequate yet they saw books as being very necessary for their courses. They also indicated that books were the most important source of information. A few students indicated that lessons and teachers' notes were the most important sources of information. Nearly half of the students use science books for woodwork or woodwork books for science. A few students have gone to a woodwork teacher to have something in science clarified, or to a science teacher to have something in woodwork clarified. The majority of the science teachers borrow equipment from the woodwork, metalwork, fashion and fabrics, food and nutrition, and agriculture departments.They do this because they feel the equipment is appropriate for teaching certain topics in science. This shows flexibility in the use of equipment.

Teachers feel that they can improve their understanding of the subjects they teach by studying these subjects at "advanced" level. Teachers are confined to teaching in one department and only those subjects in which they specialised. The teaching staff, Headmasters, and Education Officers feel that teachers meet a lot of problems if they teach subjects other than the ones in which they specialized. It was indicated that these problems can be solved.

The majority of the woodwork teaching staff expressed that they are not familiar with the contents of the science for Zimbabwe syllabus number 5006. One woodwork teacher is specialized both woodwork and science. On the other hand, the majority of the science teachers are familiar with parts of the woodwork syllabus which are related to certain parts of the science syllabus. The woodwork teacher who is familiar with the science syllabus, is the only teacher who has compared the contents of the syllabuses of the two subjects. He discovered that there are elements which are related to each other and parts of one subject are a prerequisite for the understanding of certain parts of the other.

All woodwork teachers have the idea that science emphasizes carrying out of experiments. This they think is done in an attempt to teach about the behaviour of things in the surroundings. As for science teachers, they look at woodwork

as emphasizing making of articles from wood, which can be used in the home. Some science teachers feel that it involves designing and making of working drawings of articles. The articles would be made from wood as students acquire knowledge and skills about working with wood.

It was generally expressed that integration of the two subjects is a favourable thing to do because it would improve the students understanding of the two subjects.

The scheming for the teaching of the subjects could be done in a number of ways. One would be that teachers hold a meeting to familiarize each other with the contents of the syllabuses of the subjects. Then teachers would choose elements from the other subject in which they are competent and include them in their scheme together with the elements of their own subject. The other way would be to move parts of the flexible syllabus and arrange them in such a way that they are taught at the same time as corresponding elements are taught. The subject teachers would scheme in the normal way but include in their schemes the elements from the other subject. This they would do in order to bring in the integration of the two subjects on their own.

As for the teaching arrangements, the teachers who would have chosen the elements from the other subjects would then be invited to come and teach them. The other possible way would be that the teachers in the different subjects teach the whole subject for themselves seeking to bring in the integration on their own. They would then enquire from the other teachers how to treat certain areas in which they are not competent. There were problems which were perceived to be related to integration but some solutions to these problems were paused.

Generally, it was felt that there were more advantages in teaching subjects in an integrated way than disadvantages.

It was expressed that to evaluate the results of integration a number of things could be done. For example examinations could include question about elements which will have been integrated and research could be carried out to find out the effect of integration on understanding.

4.2 Discussion of findings

The main objective of this study is to make recommendations on how the teaching of woodwork and science for Zimbabwe syllabus number 5006, could be integrated.

The method of integration considered to be suitable for Zimbabwe was the one which is called correlation. According to Tanner and Tanner (1971), in this

method an effort is made to develop common relations between subjects, in an attempt to counter isolation of the subjects. This method may be developed between two separate subjects in the same field or for those which are just closely related.

There are a number of factors which are necessary for the correlation type of integration to be possible. The factors are as follows,

(a) the availability of common elements in the subjects in question,
(b) the availability of teachers who are capable of teaching both in this case woodwork and science at "ordinary" level,
(c) the flexibility of the organization of the content of the subject for teaching as well as the timetable of the subjects. This should enable teachers of the different related subjects to make arrangements which will facilitate integration,
(d) the availability of time for teachers. This would enable them to arrange for team teaching,
(e) the ability of teachers to work with other teachers effectively when team teaching,
(f) the commitment of the teachers to integration,
(g) the ability of the teachers to identify interrelated elements,
(h) the availability of ready made material for integration, and
(i) the availability of the teachers' knowledge of subjects related to their own subjects.

The above factors and other additional factors were studied in the three schools. This was done in order to find out to what extent they were present. Considering the factors which were studied and their bearing towards integration it was found that there are in fact factors which can facilitate this type of integration, but there are also factors which hinder it. The following are the factors which would hinder the correlation type of integration.

The first factor is that of the organization of the content for teaching. The science syllabus is not perceived as being flexible so teachers follow the sequence of the syllabus as issued by the curriculum development unit. If integration is to be done in such a way that certain topics are to be taught at the same time, then it would not be possible to restructure both the woodwork and the science syllabuses. As already stated that in arranging the sequence of topics for teaching in woodwork the building up of knowledge on what is known is considered. According to the analysis of the two syllabuses, certain topics in one subject are prerequisites to some topics in the other. If a sub-topic like "the growth of timber" in woodwork requires an understanding of "plant cells" in science, it may be found necessary to wait with the topic until the time when the prerequisite will have been done. This may if done enable students to understand the topic on growth of timber better. This will make integration through correlation difficult since it will not be possible to change the sequence

of the science syllabus so that certain topics will be taught at the same time as related topics in woodwork.
The second factor is that of the use of team teaching. Team teaching is not practised even though it is perceived as being favourable in that it improves the students understanding. There are problems which are perceived as related to team teaching. These problems have some suggested solutions which were stated but some of the solutions would involve changes in the administration of the school. So it could be said that the absence of team teaching hinders the correlation type of integration.

The above factor is related to this one which is about the flexibility in the use of teachers in teaching the different subjects. There is no flexibility in the use of teachers across departments to teach on temporary basis. Teachers are confined to teaching in one department and teach only those subjects in which they specialized. This is a result of the fact that teachers are trained as specialists in certain areas. Furthermore Subject Education Officers have also indicated that woodwork teachers should not be asked to teach science or science teachers to teach woodwork. This is so because it is feared that;

1. teachers would not teach the subject to the required depth;
2. teachers would not be able to use the right terms; and
3. teachers would use improper teaching methods.

This hinders integration through correlation because it means woodwork teachers should not teach those parts of science which are related woodwork and vice versa for science teachers.

The last factor is that of the familiarity of the teaching staff with the content of the syllabus of the other subject. The majority of the woodwork teaching staff are not familiar with the science syllabus. This means that there is less likelihood that they would even be able to develop common elements between the two subjects. This is another obstacle to the correlation type of integration.

However, according to the outcome of the study there are also factors which could facilitate integration through correlation. But these factors alone are not sufficient. Considering the obstacles, consequently, there is a need to arrive at a modified type of the correlation version of integration. This type of integration would be accommodated by the factors which have resulted from the study. The suggested type of integration shall be called *interdependence type of integration.*

In this type of integration an attempt will be made to integrate elements of woodwork and those of science. This will be done by teachers of subjects who will teach the subjects in the normal way and try to link the elements of the subjects and those of the other or vice versa as they teach. Teachers need to work hand-in-hand so that they know what is being taught in the other subject at a given time. If integration is done through this method, the teachers' status will be retained. This is so because the teachers will remain teaching in their own

subjects but will be required to link the teaching of the related elements in the two subjects. This can also be accommodated because the staff have generally indicated a positive attitude towards integration. So the type of integration called interdependence can be possible.

There are the following factors which have been studied and have been found to have an outcome which can facilitate the interdependence type of integration.

The first factor is that of the availability of interrelated elements between woodwork and science. There are common elements between woodwork and science. The elements which are common to both subjects can be identified and be taught in a way which seeks to link them. This is the basis for the whole process of integration.

Another factor is that of the willingness of the teachers to integrate woodwork and science. Even though the staff members expressed fears on the effects of integration, they have positive attitudes towards integration. The fears which they have towards the effects of integration will be eliminated through this version of integration.

Yet another factor is that of flexibility in the use of the physical resources. There is flexibility in the use of physical resources which can be used in the teaching of the elements which are common to both areas. This includes such things as flexibility in the use of books from which the teachers would obtain knowledge about the other subject. There is a realization that the equipment is appropriate for teaching elements of both woodwork and science.

The last factor is that of the teachers' ways of improving their understanding of certain elements they teach. The teachers expressed the feeling that one can improve the understanding one has of the subject one teaches by studying the subject at "advanced" level. This could be useful if teachers wanted to improve an understanding of certain elements of the other subject which they might want to teach in their own subject area.

It was clear then that certain factors from the study emerged as would facilitate the type of integration called interdependence if something is done about them. The ones stated below are the factors which would have something done about.

It was found that teachers observe lessons in an attempt to learn more about the way certain elements are taught. This could be useful in integration if the observation was done in the subjects which are related to those which the teacher teaches. If teachers work hand-in-hand to integrate related elements of woodwork and science, there would be need for them to know what is being taught in the related subject as well as how it is being taught. One of the ways to learn more about the way the subject is taught as well as the subject matter is through observation of the other subject lessons. As for the fear expressed that

observation might be taken as intervening with the other teacher's lesson, this will be eliminated by the fact that the teachers will have established the aim of integration and how it can be achieved. It would then be proper that a teacher whose lesson is being observed should understand why a woodwork teacher is observing a lesson in science which is on an element which is related to certain elements in woodwork.

If the elements of the two subjects are to be integrated in this way there would be a need for the teachers to continuously communicate and inform each other about the different things. This communication can be done through meetings of the teaching staff in the two subjects. The teaching staff members can meet in interdepartmental meetings in which teachers should be included. In such meetings issues concerning the integration of the two subjects can be discussed. Such things as familiarizing each other about the common elements in the subjects in question can be done, the progress of the integration and problems met and their solutions can also be discussed. Teachers would also plan the type of questions suitable for the evaluation of the integrated elements.

When it concerns flexibility in the use of books across the subjects,it is encouraged that teachers from the different subjects involved in the process of integration use books from other subjects related to their subject as reference materials. In so doing they would be familiarizing themselves with the knowledge from the other subjects. This would be of an advantage if the knowledge they acquire from these other subjects is related to the knowledge of the subjects they teach.

Wheeler (1971, p. 259) says *Integration is not something which can be produced for the learner, though he can be helped by suitable arrangement of learning-experiences-with-content.* This means that the whole process of integration is not complete without the students themselves integrating the elements from the two subjects. The students can only integrate the related elements of the two subjects if they identify them as being related to each other. The identification of the related elements can be seen in the flexibility in the use of the books from the related subjects. It is encouraged that students should be more flexible in the use of the science and the woodwork textbooks. If they are to integrate the related elements found in these subjects there must be more flexibility in the use of books.

If teachers are to integrate the elements of woodwork and of science they should be familiar with the contents of the syllabuses of the subjects other than the ones they teach. It is recommended, therefore, that teachers be familiar with the contents of the syllabus of subjects related to the subjects they teach. This will enable them to identify the elements which are related to each other in the subjects in question. This can be facilitated by such things as teachers working closely together. Furthermore, it is necessary that teachers are familiar with the elementary knowledge of the other subject. For example woodwork

teachers should refresh their memory of ordinary level science knowledge which they may have done at school. That would be adequate as a starting point to deal with the scientific elements of woodwork.

As for the methods, it is necessary that teachers familiarize themselves with the way in which the other subject is taught. For example a sub-topic of the topic Timber is on "conversion and seasoning of timber" which also looks at simple moisture testing. The notes for guidance in the woodwork syllabus emphasizes the use of experimental and comparative methods for moisture testing. In the topic "Science in structures and mechanical systems" there is a sub-topic which is similar to this sub-topic in woodwork. The implication of the notes for guidance in the woodwork syllabus is that the woodwork teacher should be familiar with the experimental approach of teaching the subject. This approach is the one which is used in teaching science and can be acquired by the woodwork teachers enquiring from the science teachers. The other way in which they can acquire the experimental approach of teaching is by observing science lessons.

4.3 A suggested program for integration through Interdependence

In order to develop the teachers experience in integration of the two subjects it would be necessary to make an arrangement for a staff development program. This can be done within the school as the teachers do their daily work.There are a number of activities which were suggested as to be necessary to do in the processes of attempting to integrate the two subjects through interdependence. The program could start off by looking at the way scheming for integration can be done. This will be followed by arrangements for teaching and evaluation of the learning resulting from the integrated method of teaching science and woodwork.

Before scheming for the integrated teaching of the two subjects, it is recommended that teachers breakdown the subtopics into their separate elements. The breaking of the topics can be done by using the set books and other reference books in connection with the syllabus of the subject. It can be done in order to come up with the elements which constitute the different topics but may not be apparent from looking at the topic.

After breaking down the topics into their elements an interdepartmental meeting should then be held where the elements are discussed. Teachers from the other subjects will be made familiar with the elements which the other subjects deals with. The teachers would indicate these elements in the scheme of work as being dealt with in the other subject so that they should know what elements they should relate to those which they teach. This would remind the teachers when the time has come to teach the topics.

Teachers would scheme as they normally do except that they would indicate some of the elements from the other subjects which should be linked with certain elements in the subject they teach. They would seek to integrate these elements as they teach. Where the teachers are not sure, they could either enquire from the teachers of the other subject, observe lessons on the elements or read more about them.

The main part of the process which is teaching would be done such that teachers do all the teaching on their own as they normally do. The new dimension which should be brought in would be that of teachers of the related subjects working together. They would then integrate the interrelated elements in the two subjects as they teach. The working hand in hand would help in the coordination of the level to which the elements should be taught and the type of exercises to be included.

Teachers would set tests, examinations, class exercises, and homework exercises with questions which include ideas on integration. This would enable students to do both subjects each time they are taught one of the subjects. This would enable students to bring in their own integrative links.

Examinations should put more emphasis on questions which involve integrated knowledge than that is done at present. Most of the teaching is done in order to enable students to pass examinations. If the examinations would include questions on integration, then apart from evaluating the knowledge learnt through integration of subjects, it would also be encouraging teachers to focus their teaching on integration.

4.4 Recommendations of areas for further study

Having come up with the interdependence type of integration as the type of integration which can be facilitated by the prevailing conditions in the studied situations it has been found necessary that further studies should be carried out on;

(1) The feasibility of teaching woodwork and science in a way which seeks to integrated them through either the correlation or the interdependence method in the studied schools.
(2) The effect of integration on the understanding of the students of woodwork and science
(3) As to whether the bringing in of examinations with questions on integrated elements would affect the way the subjects would be taught.

REFERENCES

Best, J.W. (1981) *Research in Education.* New Jersey : Prentice Hall Inc.

Bell, J. (1987) *Doing Your Research Project.* Philadelphia: Open University Press.

Bethell, G., Duncan, T., Elliot, I., Jones, B., Mackean, D. (1987) and Stout, W. (Ed.) *Science in Zimbabwe.* Harare: John Murray

Buchmann, M. (1987) Teaching knowledge : the lights that teachers live by. *Oxford Review of Education.* Vol. No.13. No. 2. pp151-164.

Chikombah, C.E.M. (1988) *Education issues in Zimbabwe Since Independence.* Stockholm: University of Stockholm, Report.

Cunningham, R. (1971) Science: Focus on Process. In Buffie, E.G. and Jenkins, J.M. (Eds.) *Curriculum Development in Non-Graded Schools.* Ontario: Don Mills, Fitzenry and Whiteside Limited.

Dahlgren, L.O. (1984) Outcomes Of Learning. In: Marton, F., Hounsell, D. & Entwistle, N. (Ed.) *The Experience Of Learning.* Edinburgh: Schottish Academic Press.

Griffiths, M. (1986) Hirst's forms of knowledge and Körner's Categorial Frameworks. *Oxford Review of Education, Vol No. 12,* No. 1, pp.17-30.

Helmstadter, G.C. (1964)*Principles of Psychological Measurement.* New York: Appleton-Century-Crofts.

Hirst, P.H. (1974) *Knowledge and The Curriculum,* London: Routledge and Kegan Paul.

Kerlinger, F.N. (1964) *Foundations of Behavioral Research.* London: Holt, Rinehart and Winston.

Love, G. (1987) *The Theory and Practice of Woodwork.* Hong Kong : Longman Group (FE) Ltd.

Mackenzie, C.G. (1987) Zimbabwe's Educational Miracle and The Problems It Has Created. *International Review of Education, Vol. 34,* No 3.pp. 337-353.

Mason, E.J. and Bramble, W.J. (1978) *Understanding and Conducting Research /Application in Education and Behavioural Sciences.* New York: McGraw-Hill Book Company.

Nisbet, J.D. and Entwistle, N.J. (1970) *Educational Research Methods.* London: University of London Press (Ltd).

Selltiz, C., Jahoda, M., Deutsch, M. and Cook, S.W. (1959) *Research Methods in Social Relations* New York: Henry Holt and Company, Inc.

Sjögren, J. (1987) *Practical Work and Creative Ability.* Linköping: University of Linköping, Report.

Stenhouse, D. (1985) *Active Philosophy in Education and Science.* London: George Allen and Unwin.

Tanner, D. and Tanner, L. (1975) *Curriculum Development.* New York: Macmillan Publishing Company, Inc.

Wiersma, W. (1969) *Research Methods in Education: An Introduction.* New York: J. B. Lippincott Company.

Wheeler, D. K. (1971) *Curriculum Process.* London: University of London Press Ltd.

APPENDIX 1/a

INTERVIEW SCHEDULE FOR SUBJECT EDUCATION OFFICERS

1 Does a teacher decide on his own when he can teach a particular topic from the syllabus?

2 What factors determine the sequence in which particular topics from the syllabus are taught?

- Does the availability of material affect the sequence in which topics from the syllabus are taught?

- Do public examinations like the ordinary level affect the sequence in which the topics from the syllabus are taught?

3 What is you opinion on teachers using books from other departments as part of their reference material?

APPENDIX 1/b

4 How much teaching time, in terms of periods per week is given to each class for

(a) woodwork at "ordinary" level?

(b) core science at "ordinary" level?

5 What is your opinion on team teaching within departments in the school?

6 What problems do you think can be encounterd by teachers as they practise team teaching?

7 What is your opinion on interdepartmental meetings?

APPENDIX 1/c

8 What issues do you think should be discussed at interdepartmental meetings?

9 Do you observe any other subject being taught than technical subjects / science?

10 What is your opinion on science/ woodwork teachers being asked to teach science/woodwork.

11 What problems would science /woodwork teachers face as they teach woodwork / science?

APPENDIX 1/d

INFORMATION : It has been observed that there are common elements in both the science and the woodwork syllabuses for example--------.

12 What do you think about teaching in a way which links the elements found in science and in woodwork?

13 What do you think can be achieved on the students' side by teaching in such a way?

14 How do you think that scheming for an integrated teaching of woodwork and science can be done?

APPENDIX 1/e

15 How can the teaching arrangements be done in terms of

(a) teachers?

(b) students and their options?

16 What problems do you think can be encountered by the integrated teaching of the interrelated elements of woodwork and science?

17 Which two of these problems do you rate as the major ones ?

18 How can the two major problems you have just mentioned be solved?

19 How can the results of the integrated teaching of science and woodwork be evaluated?

20 How do you rate advantages as compared to disadvantages in an integrated teaching of woodwork and science?

APPENDIX 2/a

INTERVIEW SCHEDULE FOR HEADMASTERS OR DEPUTY HEADMASTERS

1 Do you get teachers who are specialized in the area in which they teach in your school?

2 What problems do teachers who are not specialized in woodwork /science meet when they teach science or woodwork?

3 How can a problem like (*selected from the given list*) be solved?

4 Does a teacher decide on his own when he can teach a particular topic from the syllabus?

5 What factors determine the sequence in which particular topics from the syllabus are taught?

- Does the availability of material affect the sequence in which topics from the syllabus are taught?

- Do public examinations like the ordinary level affect the sequence in which the topics from the syllabus are taught?

APPENDIX 2/b

6 How much teaching time, in terms of periods per week is given to each class for

(a) woodwork at "ordinary" level?

(b) core science at "ordinary" level?

7 What is your opinion on team teaching within departments in the school?

8 Name one problem which you think is encounterd by teachers as they practise team teaching.

9 What is your opinion on interdepartmental meetings?

10 What issues do you think should be discussed at interdepartmental meetings?

11 What is your opinion on teachers belonging to more than one department?

12 Do you ask teachers in certain departments to temporarily teach in other departments?

INFORMATION : It has been observed that there are common elements in both the science and the woodwork syllabuses for example--------

13 What do you think about teaching in a way which links the elements found in science and in woodwork?

APPENDIX 2/d

14 What do you think can be achieved on the students' side by teaching in such a way?

15 How do you think that scheming for an integrated teaching of woodwork and science can be done?

16 How can the teaching arrangements be done in terms of

(a) teachers?

(b) students and their options?

APPENDIX 2/e

17 What problems do you think can be encountered by the integrated teaching of the interrelated elements of woodwork and science?

18 Which two of these problems do you rate as the major ones ?

19 How can these be solved?

20 How can the results of the integrated teaching of science and woodwork be evaluated?

21 How do you rate advantages as compared to disadvantages in an integrated teaching of woodwork and science?

APPENDIX 3/a

AN INTERVIEW SCHEDULE FOR HEADS OF DEPARTMENTS OF WOODWORK AND SCIENCE

1 At which college did you train as a teacher?

2 What are your subject specializations?

3 Have you done any other studies after training as a teacher?

Yes ( ). No ( ). *(if no to 6)*

4 (a) What subject(s) have you studied?

(b) At what level have you studied them?

5 What made you feel that it was necessary for you to study the subject(s)?

6 For how long have you taught the subject(s) in which you specialized?

7 To which other department(s) do you belong?

8 Have you taught any other subjects than those in which you specialized?

Yes ( ) No ( ) If yes name them:

9 For how long have you taught the subject(s)

(a) which you specialized in?

(b) which you did not specialized in?

10 Did you meet with any problem(s) when you taught subjects other than those in which you specialized? Yes ( ) No ( )

APPENDIX 3/b

11 State one major problem which you met or expect to be encountered in teaching subjects other than those in which you specialized.

12 Briefly explain how it can be solved.

13 Do you get teachers who are specialized in the areas in which they teach in your department?

14 What two major problems do/ do you think teachers who are not specialized in woodwork /science meet when they teach science/woodwork?

15 How do you think a problem (*interviewer states*) can be solved?

16 Do you decide on your own when you can teach a particular topic from the syllabus ? Yes ( ) No ( ) . *(If Yes continue with part (a) and if No continue with part (b) of questios 17-19)*

17 (a) What influences your decision? or

(b) What determines the sequence in which one teaches different topics from the syllabus?

-Does the availability of material affect the sequence in which you teach the topics from the syllabus?

APPENDIX 3/c

- Do public examinations like the "Ordinary" level examinations affect the sequence in which you teach the topics in the syllabus?

18 (a) How often do you change the sequence in which you teach particular parts of the same level every year?

or (b) Have you ever felt a need to change the sequence in which particular topics from the syllabus should be taught?

19 (a) What could be the reason why you have kept the sequence in which you teach the topics from the syllabus?

or (b) How did you deal with the situation in (18 b)?

20 Are there any topics which you find more interesting to teach than others? Yes ( ). No ( ).

21 How much does the interest you have in a topic affect the position at which you place it in the sequence of teaching the topics?

22 Are there any set books for woodwork/ science for Zimbabwe syllabus number 5006? Yes ( ) / No ( )

APPENDIX 3/d

23 Were the set books available in the school when they were supposed to be used?

24 Do you use other books than the set books? Yes ( ). How often?

No ( )

25 What is your opinion on the use of any other book than the set books?

26 Do you use books from other departments as your reference material?

Yes ( ) No ( )

27 Do you have adequate sets of apparatus / tools and machinery in your department for teaching science syllabus number 5006/ woodwork?

Yes ( ) / No ( ).

28 How often have you had to improvise the apparatus/ tools and machinery when teaching science syllabus number 5006 /woodwork?

29 How often do you use apparatus /tools and machinery from the other departments to teach science syllabus number 5006/ woodwork?

30 What are the reasons?

APPENDIX 3/e

31 From which departments do you borrow apparatus / tools and machinery?

32 What is your opinion on team teaching within the department?

33 Do you think there are problems in practising team teaching within the department?

Yes ( ) State the major problem. No ( ) State the major advantage.

34 How often on average do you hold departmental meetings?

35 How often on average do you hold interdepartmental meetings?

36 Name the departments with which you hold interdepartmental meetings.

37 Do you personally find it necessary to hold interdepartmental meetings? Yes ( ) Why ? No ( )

38 (a) What issues do you discuss at interdepartmental meetings? or

(b) What issues do you feel should have been discussed at interdepartmental meetings if there were any?

39 How often do you observe each teacher's lessons within the department?

40 Name one major advantage of observing other teachers' lessons in the department.

41 Name one major disadvantage of observing other teachers lessons in the same department.

42 Do you observe other teachers' lessons in other departments?

Yes ( ) Give reasons.

43 Which subjects have you observed being taught?

APPENDIX 3/g

44 State one major advantage of observing lessons in different departments.

45 State one major disadvantage of observing lessons in different departments.

46 Have you ever at any time been asked to teach science / woodwork?

(If yes continue with part (a) if no continue with part (b) of Questions 47-49 below)

Yes ( ) No ( )

47 (a) For how long have you taught science / woodwork? or

(b) If you were asked to teach science or woodwork how do you think you would perform?

48 (a) Did you meet with any problem when you were teaching the subject? or

(b) Do you think you would meet with any problem if you were to teach woodwork /science?

49 (a) State one major problem which you met with when you were teaching woodwork /science or

(b) State one problem which you think you would meet if you were asked to teach woodwork / science.

50 How did you / *do you think you would* solve it?

51 Are you familiar with the contents of the woodwork/ science syllabus?

52 Have you ever compared the contents of the woodwork/ science syllabus with the contents of the science/ woodwork syllabus?

Yes ( ). Is there anything which you noticed about the contents of the two subjects?

No ( ). What, in your own opinion do you think is emphasized in science /woodwork?

INFORMATION : It has been observed that there are common elements in both the science the science and the woodwork syllabuses for example--------

53 What do you think about teaching in a way which links the elements found in science and in woodwork?

54 What do you think can be achieved on the students' side by teaching in such a way?

55 How do you think that scheming for an integrated teaching of woodwork and science can be done?

56 How can the teaching arrangements be made?

57 What problems do you think can be encountered by the integrated teaching of the interrelated elements of woodwork and science?

58 Which two of these problems do you rate as the major ones ?

59 How can these be solved?

60 How can the results of the integrated teaching of science and woodwork be evaluated?

61 How do you rate advantages as compared to disadvantages in an integrated teaching of woodwork and science?

APPENDIX 4/a

INTERVIEW SCHEDULE FOR WOODWORK AND SCIENCE TEACHERS

1 At which college did you train as a teacher?

2 What are your subject specializations?

3 Have you done any other studies after training as a teacher?
Yes ( ). No ( ). *(if no go to 6).*

4 (a) What subject(s) have you studied?

(b) At what level have you studied them?

5 What made you feel that it was necessary for you to study the subject(s)?

6 For how long have you taught the subject(s) in which you specialized?

7 To which other department(s) do you belong?

8 Have you taught any other subjects than those in which you specialized?
Yes ( ) No ( ) If yes name them.

9 For how long have you taught the subject(s)
(a) which you specialized in?

(b) which you did not specialized in?

10 Did you meet with any problem(s) when you taught subjects other than those in which you specialized? Yes ( ) No ( )

APPENDIX 4/b

11 State one major problem which you met or expect to be encountered in teaching subjects other than those in which you specialized.

12 Briefly explain how it can be solved.

13 Do you decide on your own when you can teach a particular topic from the syllabus ? Yes ( ) No ( ). *(If Yes continue with part (a) and if No continue with part (b) of questios 14-16)*

14 (a) What influences your decision? or

(b) What determines the sequence in which one teaches different topics from the syllabus?

-Does the availability of material affect the sequence in which you teach the topics from the syllabus?

- Do public examinations like the "Ordinary" level examinations affect the sequence in which you teach the topicsin the syllabus?

15 (a) How often do you change the sequence in which you teach particular parts of the same level every year?

or (b) Have you ever felt a need to change the sequence in which particular topics from the syllabus should be taught?

APPENDIX 4/c

16 (a) What could be the reason why you have kept the sequence in which you teach the topics from the syllabus?

or (b) How did you deal with the situation in (15b)

17 Are there any topics which you find more interesting to teach than others? Yes ( ). No ( ).

18 How much does the interest you have in a topic affect the position at which you place it in the sequence of teaching the topics?

19 Were the set books for science for Zimbabwe syllabus number 5006/ woodwork available in the school when they were supposed to be used?

20 Do you use other books than the set books? Yes ( ). How often?

No ( )

21 Do you use books from other departments as your reference material

Yes ( ) How often? No ( )

22 Is there any particular reason why you use / do not use other books than the set books as your reference material?

23 What is your opinion on the use of any other book than the set books?

APPENDIX 4/d

24 How often do you use apparatus /tools and machinery from the other departments to teach science syllabus number 5006/ woodwork?

25 How often do you use apparatus / tools and machinery from other departments to teach science syllabus number 5006/woodwork?

26 What are the reasons?

27 From which department do you borrow apparatus / tools and machinery?

28 What is your opinion on team teaching within the department?

29 Do you think there are problems in practising team teaching within the department?

Yes ( ) State the major problem No ( ) State the major advantage

30 What is your opinion on holding an interdepartmental?

APPENDIX 4/e

31 What issues should be discussed at interdepartmental meetings?

32 How often do you observe other teachers' lessons within the department?

33 What is the major advantage of observing other teachers' lessons in the department?

34 What is the major disadvantage of observing other teachers lessons in the same department?

35 Do you observe other teachers' lessons in other departments?

36 Which subjects have you observed being taught?

37 What is the major advantage of observing lessons in different departments.

38 What is the major disadvantage of observing lessons in different departments?

39 Have you ever at any time been asked to teach science / woodwork?
Yes ( ) / No ( ) *(If yes continue with part (a) if no continue with part (b) of Questions 40-42 below)*

40 (a) For how long have you taught science / woodwork? or
(b) If you were asked to teach science or woodwork how do you think you would perform?

41 (a) Did you meet with any problem when you were teaching the subject? or
(b) Do you think you would meet with any problem if you were to teach woodwork /science?

42 (a) State one major problem which you met with when you were teaching woodwork /science or
(b) State one problem which you think you would meet if you were asked to teach woodwork / science

43 How did you / do you think you would solve it?

APPENDIX 4/g

44 Are you familiar with the contents of the woodwork/ science syllabus?

45 Have you ever compared the contents of the woodwork/ science syllabus with the contents of the science/ woodwork syllabus?

Yes ( ). Is there anything which you noticed about the contents of the two subjects?

No ( ). What, in your own opinion do you think is emphesized in science /woodwork

INFORMATION : It has been observed that there are common elements in both the science the science and the woodwork syllabuses for example--------

46 What do you think about teaching in a way which links the elements found in science and in woodwork?

47 What do you think can be achieved on the students' side by teaching in such a way?

48 How do you think that scheming for an integrated teaching of woodwork and science can be done?

49 How can the teaching arrangements be made?

50 What problems do you think can be encountered by the integrated teaching of the interrelated elements of woodwork and science?

51 Which two of these problems do you rate as the major ones ?

52 How can these problems be solved?

53 How can the results of the integrated teaching of science and woodwork be evaluated?

54 How do you rate advantages as compared to disadvantages in an integrated teaching of woodwork and science?

APPENDIX 5/a

LINKÖPING UNIVERSITY NOVEMBER, 1988.

DEPARTMENT OF EDUCATION AND PSYCHOLOGY

MA TECHNICAL EDUCATION

STUDENTS' QUESTIONNAIRE FORM THREE

This questionnaire is part of a research project concerning the linking of Woodwork and Core Science syllabus number 5006 at "Ordinary" level. Your responses will help in providing the necessary information concerning this research project.

The Researcher is a Zimbabwean, under the University of Zimbabwe Staff Development Program. He is doing his studies in Technical Education at Linköping University in Sweden.

Please answer the following questions honestly and openly. Do not give your name. The answers will be handled by the Researcher only and be used solely for academic purposes.

Your co-operation is greatly appreciated.

Sydney P. Assani.

APPENDIX 5/b

INSTRUCTIONS :

Fill in the blank spaces provided for each of the following questions with the appropriate word, sentence, or tick ( ) wherever applicable.

1 Name of school _____

2 Do you have enough textbooks for the following subjects

(a) core Science (syllabus number 5006) ( ) Yes.
( ) No.

(b) Woodwork ( ) Yes
( ) No

3 Do you think that you need these textbooks ?

( ) Yes.
( ) No.

4 Choose three most important sources of information from the following list. Arrange the source of information you have chosen in order of their importance as sources of information in school. Give the most important source a number (1) and the third a number (3)

Science	Woodwork
( ) Books	( ) Books
( ) Teachers' notes	( ) Teachers' notes
( ) Lessons	( ) Lessons
( ) Friends	( ) Friends
( ) Other sources_____	( ) Others sources _____

5 Have you at any time used science textbooks for woodwork ?

( ) Yes
( ) No

APPENDIX 5/c

6 Have you at any time used woodwork textbooks for science?

( ) Yes.

( ) No.

7 Does your teacher ask you to use books from other subjects to do your science class exercise / homework ? ( ) Yes.

( ) No.

woodwork class exercise/homework? ( ) Yes.

( ) No.

8 Have you at any time gone to a woodwork teacher to get something in science clarified?

( ) Yes.

( ) No.

9 Have you at any time gone to a science teacher to have something in woodwork clarified?

( ) Yes.

( ) No.

APPENDIX 6

DEPARTMENT OF CURRICULUM STUDIES
FACULTY OF EDUCATION

Chairman: L. M. Nyagura, BSc., MSc., PhD.

P O Box MP 167
Mount Pleasant
Harare
Zimbabwe

Telegrams: UNIVERSITY
Telephone: 303211
Telex: 4-152 ZW

UNIVERSITY OF ZIMBABWE

14 November 1988

TO WHOM IT MAY CONCERN

Dear Sir/Madam

[illegible] is an M.A. Technical student who is visiting your school/~~institute~~/~~centre~~ to carry out some research for the M.A. degree he/~~she~~ is studying at [illegible].

Please assist ~~her~~/him. He is attached to the University of Zimbabwe at present.

S. MONDO
Acting Chairman, Curriculum Studies.